Running Head: THE CASE FOR MODEL COMPARISON AND THEORETICAL INTEGRATION

The Case for Health Behaviour Model Comparison and Theoretical Integration: Comparing and Combining Predictions of Models in Order to Optimise the Prediction of Health Behaviours

Jay Richards

B.Psyc(Hons)

Doctor of Philosophy (Clinical Psychology)

Univesity of Newcastle

Statement of Originality

The thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to the final version of my thesis being made available worldwide when deposited in the University's Digital Repository, subject to the provisions of the Copyright Act 1968.

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Contents in Brief

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List of Common Abbreviations Used in this Thesis

ABS – Austrralian Bureau of Statistics

AIC – Akaike Information Criterion

AIHW – Australian Institute of Health and Welfare

BMI – Body Mass Index

DoHA – Department of Health and Aging (Australia)

EIM – Extended Integrated Model

ELM – Elaboration Likelihood Model

EPPM – Extended Parallel Process Model

HBT – Health behaviour theory

HSM – Heuristic-Systematic Model

IN*MTC – Injunctive norms * Motivation to comply interaction term

NHMRC – National Health and Medical Research Council

NRT – Nicotine Replacement Therapy

OECD – Organisation for Economic Co-operation and Development

PBC – Perceived Behavioural Control

PMT – Protection Motivation Theory

PMT-R – Revised form of Protection Motivation Theory (i.e., Rogers, 1983)

RPA – Risk Perception Attitude Framework

TPB – Theory of Planned Behaviour

TRA – Theory of Reasoned Action

WHO – World Health Organisation

Abstract

The health behaviour literature is currently littered with theoretical models offering competing accounts of the determinants of health behaviour. However, despite the large amount of research there is still no consensus regarding which model/s are the most useful and accurate. A reason for this is that there are few studies comparing these models for their effectiveness in explaining health behaviour. One method of determining which health behaviour models are superior is directly comparing models for accuracy. Another method of improving the prediction of health behaviour may be theoretical integration – that is combining predictions of multiple models within the rich health behaviour literature in order to develop an integrated model with greater explanatory power than its constituent models. The four research studies presented herein represent examples of how model comparison and theoretical integration may be applied to identify the existing health behaviour models with greatest explanatory power and to increase the explanatory power of such models respectively.

Study 1 investigates how fear-based messages impact on individuals' health knowledge. It also investigates whether health knowledge contributes to the prediction of intentions to exercise or adopt a healthy diet after controlling for Protection Motivation Theory constructs. Results suggest that fear-based messages do not affect information retention and that health knowledge does not explain unique variance in behavioural intentions.

Studies 2 and 3 compared the predictions of the Theory of Planned Behaviour and Protection Motivation Theory. Study 2 was conducted in the context of smoking and Study 3 was conducted in the context of diet and exercise. An integrated model which combined the predictions of the Theory of Planned Behaviour and Protection Motivation Theory was also devised and tested. Results of both studies suggested that

the Theory of Planned Behaviour was the superior model – performing equivalently or better than Protection Motivation Theory in terms of accuracy for all health behaviours investigated. Investigating the integrated model highlighted relationships between constructs of both theories – most notably a consistent relationship between response-efficacy and attitudes.

Finally, in Study 4 an integrated model combining the predictions of the Extended Parallel Process Model, Theory of Planned Behaviour, Stage Model and Risk Perception Attitude Framework is devised and tested. This model attempted to explain individuals' responses to a fear-provoking health message based on their existing psychological characteristics and the message components. It was found that fear-provoking messages elicited little change in individuals' perceptions of threat and efficacy and their attitudes and intentions. However, fear-provoking messages were associated with greater fear and maladaptive defensive responses – especially in those who were not already engaging in health protective behaviour. Numerous heretofore undiscovered associations between constructs of these models (e.g., individuals' thoughts concerning the fear-provoking health message [Stage Model] being associated with reactance, defensive avoidance, self- and response-efficacy [Extended Parallel Process Model]) were also highlighted as a result of investigating the predictions of the integrated model. Taken together these findings suggest that model comparison can be utilised to identify the superior model from a candidate set of models. Further, theoretical integration can be utilised to increase the explanatory power of existing health behaviour models. Implications for theory and practice are discussed at length.

Chapter 1: Thesis Overview

Understanding the determinants of health behaviour is a popular focus of health psychology research. Developing an understanding of the factors that determine health behaviour is essential for researchers and health promotion practitioners to effectively motivate healthy behaviours in the wider population. If such efforts are successful, the rates of preventable disease will significantly decrease. Numerous theorists have developed models that purport to explain health behaviour. As a result, the health behaviour literature is currently littered with several such models (Noar & Zimmerman, 2005; Weinstein, 1993). However, at present none is universally accepted as the definitive health behaviour model. No single health behaviour model can consistently explain all or even most of the variance in health behaviour or health behaviour intentions (e.g., Armitage & Conner, 2001; de Hoog, Stroebe & de Wit, 2007; Floyd, Prentice-Dunn & Rogers, 2000; Harrison, 1992; McEachan, Conner, Taylor & Lawton, 2012; Milne, Sheeran & Orbell, 2000; Rosen, 2000; Witte & Allen, 2000). As such, there is much room for improvement in models applied to explaining health behaviour.

The central thesis of the present work is that the predictions of two or more models of health behaviour can be usefully combined to complement one another and optimise the prediction of health behaviours and related outcomes (i.e., theoretical integration). Hagger (2009) argued that theoretical integration could improve the explanatory power of existing health behaviour models by eliminating explanatory gaps in the constituent models. Integrated models may also be applied more broadly – explaining outcomes unaccounted for by the constituent models (Hagger, 2009, 2010). Several constructs across health behaviour models are very similar or identical (e.g., Hagger, 2009, 2010; Maddux, 1993; Noar et al., 2005). Theoretical integration can highlight these redundancies simplifying the literature as a whole – the case for theoretical integration is fully developed in Chapter 2.

The present work is organised into eight chapters. The current chapter (Chapter 1) is an overview of the thesis. Chapter 2 represents the primary literature review underpinning the research presented in the present work. This review will firstly discuss the current state of public health and health promotion in Australia and around the world with a specific focus on fear provoking health messages. A history of fear appeal theory and research is then presented including a review of: the Drive theories (e.g., Hovland, Janis & Kelly, 1953; Janis, 1967); Parallel Response Model (Leventhal, 1970); Protection Motivation Theory (Rogers, 1975; 1983); the Extended Parallel Process Model (Witte, 1992; Witte & Allen, 2000); the Stage Model (Das, Stroebe & de Wit, 2003; de Hoog, Stroebe & de Wit, 2005, 2007, 2008) and the Risk Perception Attitude Framework (Rimal, 2001; Rimal & Real, 2003). The reasoned action approach to the prediction of health behaviour is then considered; specifically the Theory of Reasoned Action (Fishbein & Ajzen, 1975) and the Theory of Planned Behaviour (Ajzen, 1985, 1987, 1991) are critically reviewed.

In light of discussion of these models, it is then argued that the current strategy adopted in the health behaviour literature – proliferation and testing of theories – is unlikely to increase our overall understanding of the determinants of health behaviour. The health behaviour literature is littered with numerous theoretical models. However, the literatures concerning each of these models have very little overlap (Noar et al., 2005). These literatures tell us a lot about the models under consideration, but much less about the health behaviour literature as a whole. As a result, the literature is fragmented and is failing to converge on a single workable solution to the problem of predicting health behaviour. At the end of Chapter 2, it is argued that two alternative approaches may be applied to help reconcile the health behaviour literature and improve our understanding of the determinants of health behaviour: model comparison and theoretical integration.

Model comparison refers to comparing current theoretical models for their ability to explain the same outcome (e.g., exercise behaviour or intentions). Comparing models is useful as it can answer the question of whether model A is better than model B in explaining outcome X. This allows models with lesser explanatory power or verisimilitude to be rejected – which is essential for scientific progress (Popper, 1959). However, very few studies in the health behaviour literature have compared the accuracy of models (Noar et al., 2005). This means that health promotion practitioners cannot judge which model is the best model to apply in a given situation. Theoretical integration refers to combining predictions from two or more separate models in order to devise a model which has greater explanatory power and/or can be applied more broadly than its constituent models. It is argued that both approaches have substantial value for improving our understanding of the factors which motivate health behaviours.

Chapter 3 will outline the overarching aims of the research program described in the present work. How each of the four research studies contribute to each of these aims will also be discussed in this chapter. The four studies each focus on the prediction of health behaviour and build upon one another. The first study described in Chapter 4 aims to investigate whether individuals' knowledge about the health effects of being overweight/obese affects their response to a fear-provoking message on intentions to exercise and maintain a healthy diet. Further, the study aims to investigate whether the addition of health knowledge can improve the predictive power of Protection Motivation Theory for predicting diet and exercise intentions.

Chapter 5 describes the second study, which aims to compare the Theory of Planned Behaviour and Protection Motivation Theory for their ability to predict intentions to quit smoking and use nicotine replacement therapy. An integrated model which combines the predictions of the Theory of Planned Behaviour and Protection Motivation Theory is also forwarded and tested. Chapter 6 describes study three. Study three is a replication of study two with a larger sample size and in a different health context – diet and exercise. This further validates the integrated model proposed in study two. In Chapter 7, study four is described. Study four is a longitudinal study which builds upon studies one, two and three. This study is designed to test an integrated model which combines the predictions of the Extended Parallel Process Model, Theory of Planned Behaviour, Stage Model and the Risk Perception Attitude Framework. The integrated model investigated in this study aims to investigate whether individuals existing cognitions influence how they respond to a fear provoking health message. The model also aims to predict numerous outcomes including health knowledge, defensive responding, cognitions, attitudes, intentions and behaviour. The model validates several relationships between constructs across the health behaviour models which have heretofore not been established. Ultimately, it is a model which makes several novel predictions and can be more broadly applied than the four constituent models.

Chapter 8 of this work summarises the arguments presented herein and discusses the implications of the research programme as a whole. The real world implications of the research will be discussed along with suggestions for health promotion practice that follow from the research presented in this thesis. Finally, limitations of the research programme will be discussed and directions for future research will be suggested.

It is important to mention that the studies discussed herein do not represent a definitive and complete case for model comparison or theoretical integration. Rather they represent examples of how model comparison and theoretical integration may be applied to identify health behaviour models with greater explanatory power and increase the explanatory power of such models respectively. In the same spirit, the integrated model proposed herein should not be viewed as a complete model of health behaviour. It remains a dynamic work in progress, which should be augmented and refined as its predictions are investigated further. Therefore, the present work should not be viewed as forwarding a new health behaviour model. Rather it is promoting a method of improving the explanatory power of health behaviour models – theoretical integration – and providing some preliminary data in service of that goal.

Chapter 2: Literature Review

The prediction and explanation of health behaviours is a popular area of research within health psychology and related disciplines. Predicting and explaining health behaviour is important as many preventable diseases (e.g., coronary heart disease, lung cancer, skin cancer, type 2 diabetes) are determined by high rates of unhealthy behaviours in the population (Australian Institute of Health and Welfare [AIHW], 2010). If individuals change their health behaviour (e.g., quit smoking, adopt a healthy diet, engage in adequate exercise) their risk of being affected by these diseases can decrease dramatically (Australian Bureau of Statistics [ABS], 2010; World Health Organisation [WHO], 2002). As such, it is important to understand what motivates individuals to engage in healthy behaviours *and* why they do not do so. With this understanding we may be able to devise effective interventions to motivate individuals to adopt these healthy behaviours. This in turn could dramatically reduce the disease burden associated with several preventable diseases.

The State of Public Health in Australia

Developing effective intervention programs is important as engaging in unhealthy behaviours has a significant impact on Australian's health. Health expenditure is currently at 140.24 billion dollars per year and has been rising precipitously since 2002 (82.89 billion; AIHW, 2012, 2013). Expenditure on health promotion and prevention efforts has also increased over this period with 2.30 billion dollars being spent during 2008-09 compared with 2.18 billion dollars the previous year. Average growth in public health expenditure has increased an average of 7.3% per year since 1999-00 (AIHW, 2011a). And in 2007 (most recent available statistics) preventable diseases – those which could be prevented through a change in behaviour – accounted for 37.8% of all premature deaths in Australia (approximately 18000 deaths; AIHW, 2011a). Several unhealthy behaviours are key determinants of many preventable diseases and health conditions (e.g., Type 2 Diabetes, stroke, cardiovascular disease and many cancers; Yach, Hawkes, Gould & Hofman, 2004). These behaviours include: tobacco smoking, poor diet, physical inactivity and alcohol misuse (AIHW). Another important factor contributing to the disease burden is the overweight/obesity.

Tobacco Smoking

Smoking is estimated to be the cause of over five million deaths per year worldwide (WHO, 2006). It has been identified as the “single most preventable cause of ill health and death in Australia” (AIHW, 2011a, pg. 28). It is a determinant of coronary heart disease, stroke, peripheral vascular disease and several forms of cancer (e.g., lung, larynx and mouth). Tobacco smoking was responsible for 7.8% of the disease burden in Australia during 2003 (Begg, Vos, Barker, Stephenson, Stanley & Lopez, 2007). Collins and Lapsley (2008) estimated the total social costs attributable to tobacco smoking to be 31.49 billion dollars, increasing from 25.50 billion dollars in 1998-1999. However, between 2001 and 2012, the estimated proportion of the Australian population identifying themselves as smokers decreased for both males (from 26.1% to 19.5% of the population) and females (20.1% to 15.6%; ABS, 2013).

Poor Diet

Maintaining a healthy diet is associated with significant benefits to health including reducing the chances of developing chronic illnesses associated with obesity (AIHW, 2012; Mente, de Koning, Shannon & Anand, 2009; Organisation for Economic Co-operation and Development [OECD], 2011; WHO, 2000). A balanced diet of fruits, vegetables and legumes, cereals, dairy and meat or meat alternatives which is low in saturated fat, salt and sugar is recommended (AIHW, 2010; WHO, 2002). However, in many countries these dietary guidelines are not followed by a large proportion of the population, and as a result there has been a marked increase in obesity rates across several countries over the last 10-20 years (AIHW, 2010; OECD). For example, in Australia low fruit and vegetable intake was estimated to contribute 2.1% of the overall disease burden in 2003 (Begg et al., 2007). In Australia, between 2005 and 2008 the rates of inadequate fruit and vegetable intake (i.e., <5 servings of vegetables and <2 servings of fruit per day) rose for both males (91.6% - 95.1%) and females (88.2% – 92.6%; ABS, 2010). The most recent estimates (2011/2012) showed a further increase in the number of Australians not meeting the recommended guidelines for both fruit and vegetable intake with only 4.5% of males and 6.6% of females meeting the recommended guidelines. More individuals met guidelines for fruit intake (48.3%) than vegetables (8.3%; ABS, 2013).

Physical Inactivity

It is widely acknowledged that regular physical activity is associated with significant physiological and psychological benefits (e.g., Warburton, Nicol & Bredin, 2006; Williams, 2001). These benefits include reduced risk of cardiovascular disease, diabetes and depression. Exercise can also be used to control weight and prevent overweight/obesity (ABS, 2013; Begg et al., 2007; WHO, 2002). However, in many westernised countries, less than half the population meet the minimum recommended physical activity requirements to achieve these health benefits (ABS, 2013; AIHW, 2010; Cameron, Craig, & Paolin, 2004; U.S. Department of Health and Human Services, 2003). In Australia in 2003, physical inactivity was estimated to contribute 6.6% of the burden of disease (Begg et al.). Currently in Australia it is recommended that individuals engage in at 150-300 minutes of moderate exercise per week to achieve health benefits (Brown, Bauman, Bull & Burton, 2012). This constituted an increase from previous guidelines (30 minutes per day five days per week). Between 2001 and 2008, the number of people who engaged in inadequate levels of exercise (sedentary or low levels of exercise) increased in both males (65.0% to 68.6%) and females (73.7% to 76.1%; ABS, 2010). Most recent statistics (2011/2012) have shown a decrease in the rates of inadequate exercise among males (62.4%, 33.8% sedentary) and females (67.5%, 38.2% sedentary; ABS, 2013). Statistics from the Australian Sports Commission (2010) suggest that 82.3% of the population engage in physical activity at least once per year, 69.4% engage in physical activity at least once per week, 47.7% at least three times per week and 28.0% at least five times per week. This indicates that although most Australians engage in at least some physical activity, most do not engage in the recommended levels of exercise.

Overweight/Obesity

Overweight/obesity increases one's risk of several diseases including: cardiovascular disease, Type 2 diabetes, musculoskeletal conditions and some cancers (WHO, 2002). As weight increases so does the risk of being affected by these diseases (AIHW, 2010). The World Health Organisation (2014) estimates that the worldwide rates of obesity have nearly doubled since 1980. In 2008, 1.4 billion people worldwide were estimated to be overweight (Body Mass Index [BMI] > 25), with 500 million of those being obese (BMI > 30; WHO, 2014). Begg et al. (2007) estimated that the excess body weight contributed 7.5% of the burden of disease in Australia in 2003. Between 2001 and 2008 rates of overweight/obesity increased for both males (57.5% to 62.8%) and females (42.2% to 47.6%). Most recent estimates (2011-2012) have shown a further increase in overweight/obesity in both males (70.3%) and females (56.2%). Rates of obesity are 28.4% for males and 28.2% for females (ABS, 2013). However, even these high figures may be underestimates as these estimates are based on self-report data. It has been noted that individuals tend to overestimate their height and underestimate their weight

(AIHW, 2010). This would lead to underestimation of BMI and consequently higher rates of overweight/obesity.

Alcohol Misuse

Excessive alcohol consumption is associated with several adverse health effects including cardiovascular disease, some cancers, cirrhosis of the liver and mental health conditions (National Health and Medical Research Council [NHMRC], 2009). It is second only to tobacco smoking as the leading cause of drug related death or hospitalisation (NHMRC). Alcohol was responsible for approximately 2.3% of the burden of disease in Australia. However, there was a stark disparity for the burden of disease for males (3.8%) when compared with females (0.7%) suggesting males are much more likely to drink more heavily and encounter health problems as a result of alcohol intake (ABS, 2010; Begg et al., 2007) – likely due to their higher intake of alcohol when compared with females (ABS, 2010; AIHW, 2011b). Collins et al. (2008) estimated that the social cost attributable to alcohol was 15.32 billion dollars in 2004-05. Between 2001 and 2008, the proportion of the Australian population engaging in risky/high risk alcohol use (>50ml of pure alcohol per day) increased for both males (13.1% to 15.0%) and females (8.5% to 11.7%; ABS, 2010). Most recent estimates (2011-2012) have shown a slight decline in the rates of risky/high risk alcohol use for both males (13.4%) and females (10.1%). However, 29.1% of males and 10.1% of females exceed the NHMRC (2009) guidelines to reduce the health risks of consuming alcohol.

In summary, the health behaviours described above are large contributors to the disease burden in Australia and around the world. Although we are seeing decreasing trends in some health behaviours (i.e., smoking and physical inactivity), many of these health behaviours are becoming more prevalent over time (high/risky alcohol use, low fruit and vegetable intake). Poor diet, physical inactivity and alcohol intake also contribute to the disease burden through their association with overweight/obesity (AIHW, 2008, Begg et al., 2007). Currently more than 60% of the Australian population is overweight and over a quarter of the population is obese (ABS, 2013). Therefore, it is clear that unhealthy behaviours have a significant and detrimental impact on Australian's health.

The Australian government has an interest in promoting healthy behaviours in its citizens. The government exercises this interest by utilising health promotion strategies spending 425.8 million dollars on these in 2010-2011 alone (AIHW, 2012). Health promotion interventions often target unhealthy behaviours such as smoking, poor diet, physical inactivity and alcohol misuse. The aim of these interventions is to reduce the incidence and prevalence of unhealthy behaviours in order to reduce the burden of disease attributable to these behaviours. However, despite these efforts the prevalence of several unhealthy behaviours remains high or is increasing (ABS, 2010, 2013). Although this state of affairs is most likely not attributable to the interventions themselves, it appears that health promotion efforts have had limited success in promoting adaptive behaviour change across the Australian population as a whole. This suggests that there is room for improvement in the design and implementation of health promotion efforts.

Fear Appeals

One of the strategies utilised in Australia, and around the world, to motivate the adoption of healthier behaviours is the fear appeal; which will be the focus of this review. A fear appeal is a message designed to motivate the adoption of healthy behaviours in the target population. Fear appeal messages aim to decrease the rates of unhealthy behaviours by emphasising the negative consequences of engaging in these behaviours. Recent Australian fear appeal campaigns have targeted several health behaviours; notably smoking (Wakefield, Freeman & Boulter, 1999), alcohol misuse (National Binge Drinking Campaign, 2009), diet and exercise (Australian Government, 2010), and sun protection (Department of Health and Aging [DoHA], 2010a). A fear appeal typically comprises of an explicit health threat (e.g., "Cigarettes cause deadly lung cancer") and a recommended response which will help alleviate this threat (e.g., "quit smoking"). The principle behind fear appeals is that threats to health motivate protective action (Janis & Feshbach, 1953; Rogers, 1975, 1983). It is argued that fear appeals work by eliciting fear and anxiety (Ruiter, Abraham & Kok, 2001). This state is believed to prompt feelings of vulnerability to the health threat, which in turn produces the motivation to take protective action (Ruiter et al.)

Large scale Australian fear appeal campaigns targeting smoking have been associated with decreased smoking prevalence in recent years (Wakefield et al., 2008; Wakefield, Lowin & Hornik, 2010). These reductions are likely due to both current smokers quitting smoking (Bala, Strzeszynski & Cahill, 2008) and a reduction in the uptake of smoking among young people (National Cancer Institute, 2008; Wakefield et al., 2010). However, it is problematic to attribute positive changes in smoking rates to the fear appeal messages alone. This is because these campaigns have coincided with increased taxation, bans on advertising, restricted access and legislation banning smoking in many public areas (Bala et al., 2008; Green, 2000; Hammond, Fong, McDonald, Brown, & Cameron, 2004; Wakefield et al., 2010; Wakefield et al., 2008; cf. McGuire, 1984) in addition to newer developments such as plain packaging, warning labels on cigarette packaging and low visibility in stores. Given the number of strategies applied simultaneously it is difficult to tease out which strategies are active in reducing smoking prevalence. Therefore, a cursory look at the evidence for fear appeals targeting smoking suggests that they may be effective (Bala et al.). However, alternative explanations for the reduction in overall smoking prevalence cannot be ruled out.

Other researchers argue that the evidence base for the efficacy of antismoking messages and warning labels is flawed and these strategies may be ineffective or even counterproductive (Erceg-Hurn & Steed, 2011; Ruiter & Kok, 2005; Ruiter et al., 2001). For example, Ruiter and Kok highlight the lack of experimental evidence investigating warning labels and that there is no evidence that quit rates have increased following the introduction of these labels. Other findings suggest that individuals may take antismoking messages as a threat to their freedom, leading to reactance (Brehm, 1966; Brehm & Brehm, 1981) – i.e., rebelling against the message proponents wishes by increasing their smoking behaviour (Erceg-Hurn et al.; Robinson & Killen, 1997; Wolberg, 2006). Erceg-Hurn et al. found that reactance was greater in individuals who viewed graphic health warning labels when compared with text only. Wolberg found that many university students who were smokers experienced antismoking messages as annoying and ineffective and often responded with reactance. For example, one participant stated that "All the [American antismoking campaign] does is convince me that I should go outside and light up another cigarette." (pp. 294). These findings suggest that fear appeal messages may be ineffective or have unintended negative effects.

Australian fear appeal campaigns have targeted other health behaviours such as poor diet, physical inactivity (DoHA, 2010b; Miller & Tuffin, 2009), alcohol misuse (National Binge Drinking Campaign, 2009) and sun protection (DoHA, 2010a). However, these campaigns had poorer outcomes in terms of measurable behaviour change over the course of the campaign than that for tobacco smoking. The "Dark Side of Tanning Campaign" (DoHA, 2010a) achieved mixed results. Decreases in self-reported tanning behaviour and sun protective behaviours (e.g., wearing hats, sunscreen, seeking shade) were observed over the course of the campaign, however outcomes related to frequency of sunburn were either unchanged from baseline or were in the opposite of the expected direction (DoHA, 2010a). Evaluation of the effects of the binge drinking campaign revealed no significant decreases in teenage drinking incidence, drinking frequency, and risk level of the drinking behaviour. One significant decrease was reported (No. of drinks consumed in last drinking session for 15-17 year olds) however the evaluation document noted that the pre-test of alcohol intake was during the end of year/school holiday period which may have skewed results as students drinking behaviour may increase during the holiday period relative to mid-year. Trends towards reduced alcohol related violence were reported but for most outcome measures these were non-significant. Similarly, the Measure Up Campaign evaluation document (DoHA, 2010b) reported that: "Changes attributable to the campaign in knowledge, current behaviour, and intentions relating to fruit and vegetable consumption and physical activity were somewhat limited" (pg. iii). Very few significant increases in desirable behaviours were reported over the course of the campaign (Miller et al.; DoHA, 2010b). Further some decreases in desirable behaviours were reported including decreases in rates of sufficient physical activity, intentions to increase physical activity during the next month and intentions to increase fruit consumptions (Miller et al.). Obviously it is unlikely that these decreases were attributable to the campaign; but these findings do suggest that the campaigns failed to reverse the trend towards more unhealthy eating habits and sedentary behaviour in the Australian population.

It may be argued that a key difference between these campaigns and those applied to tobacco is that punitive governmental strategies such as high taxation, restricted access and advertising bans have been more widely applied to tobacco products than alcohol or unhealthy foods. Taxation has been applied to alcohol in Australia but as been less effective in reducing risky/high risk drinking behaviour. It has been argued that there is a lack of common sense in some of the ways that the tax is applied in Australia. For example, some high alcohol products (e.g., cask wine) are taxed at a lower rate than for low alcohol products (e.g., light and mid-strength beer; Vanderberg, Livingston & Hamilton, 2008). Therefore, the taxation is less likely to have the desired deterrent effect for problem drinkers as they can select cheaper products with higher alcohol content. There is a feasibility problem with applying such punitive strategies to health problems such as physical inactivity and obesity as there is no associated product to tax or restrict access to (McGuire, 1984). McGuire argues that health messages alone are likely to have limited impact on behaviour change as in order to elicit behaviour change they first need to elicit a number of mediating responses each of which have a low probability attached to them. These responses include:

> “being exposed to the health communication, attending to it, becoming involved in it, comprehending its contents, agreeing with what it says, acquiring the skills necessary for compliance, retaining these over time and acting on the basis of them” (McGuire, pp. 303).

Thus, the path from message exposure to behaviour change is not simple, but the sum total of a series of unlikely intermediate events. In support of this view, campaign evaluations often find much larger effects of the message on factors such as recognition of the message, information retention and attitudes but a relatively modest impact on behaviour change (e.g., DoHA, 2010b; National Binge Drinking Campaign, 2009; Wakefield, Freeman & Boulter, 1999). Taken together this suggests that the unique effect of a health message on behaviour change may be relatively small compared to the effect of punitive governmental strategies. Therefore, much of the observed reduction in smoking prevalence may be attributable to these punitive strategies alone.

Wakefield et al., (2010) reviewed the effectiveness of health promotion campaigns, including fear appeals, covering several health issues. Overall, health promotion was deemed to be moderately effective for eliciting a positive change in most health behaviours (e.g., physical activity, immunisation, condom use, fruit and vegetable intake). The authors concluded that there is strong evidence for the benefit of fear appeal campaigns which targeted smoking. Weak or inconclusive evidence was found for interventions that targeted alcohol misuse and sun protection. The authors noted that many studies did not contain control groups not exposed to the campaign and thus it was problematic to separate the effects of the campaign from the effects of other strategies (e.g., increased taxation, restrictions). It has also been found that that short-term gains attributable to health messages are difficult to maintain over time, especially after the health message is no longer in circulation (e.g., Cavill & Bauman, 2004; Pomerleau, Lock, Knai & McKee, 2005; Wakefield et al., 2008). This suggests that fear may be an effective strategy for changing some health behaviours, but not others, and there is room for improvement in the design and implementation of health messages and fear appeal campaigns.

Snyder et al., (2004) conducted a meta-analysis of mass media communication campaigns in the United States finding that in general effect sizes were very modest (mean r = .09). Noar (2006) noted that the meta-analysis may have overestimated the effects due to journal's publication bias favouring significant findings (cf. Rosenthal, 1991). Snyder et al. noted that effects differed by the type of behaviour with campaigns targeting seat-belt use and oral health being more effective than those targeting smoking, breast cancer screening and sexual behaviours. Campaigns calling for the commencement of a new behaviour (e.g., seat belt use) were more generally more effective than those calling for the cessation of an established pattern of problem behaviour (e.g., quitting smoking). Further, campaigns which were supported by punitive changes in legislation were more effective than those without. This finding may explain the apparent effectiveness of anti-smoking campaigns in Australia – the punitive strategies applied (i.e., increased taxation, plain packaging, restricted smoking areas) may have been more responsible for the positive effect than the campaign messages. Taken together these findings indicate that the effect of health messages on behaviour change may be relatively modest, and that these messages are more likely to motivate behaviour change when they attempt to have respondents commence a new behaviour and are coupled with punitive strategies.

Utilising Theory in Health Promotion Practice

The determinants of health behaviour are very complex, thus designing effective health promotion interventions and evaluating programs can be very difficult. However, this process is made easier if programs are guided by theory (Green, 2000; Murray-Johnson, Witte, Boulay, Figueora & Tweedie, 2006). Several researchers suggest that theory should be utilised to guide program formation, implementation and evaluation (e.g., Ajzen, 1998; Green, 2000; Green & Tones, 1999; Johnston & Dixon, 2008; Michie, Johnston, Francis, Hardeman & Eccles, 2008; Nation et al., 2003; Noar, 2006; Randolf & Viswanath, 2004; Stead, Tag, Mackintosh & Eadie, 2005; Stokols, 1995). Further, meta-analytic reviews have provided evidence that interventions based on theory are more effective than those which are not (e.g., Han et al., 2009; Kirby et al., 1994; Lopez, Tolley, Grimes, Chen & Stockton, 2013; Noar, Benac & Harris, 2007; Ratner, Bottorff, Johnson, Cook & Lovato, 2001).

Green (2000) identified that there are two types of theory relevant to health promotion practice “explanatory theory and change theory” (pg. 125). Explanatory theory will be the focus of the current review and refers to theories which attempt to provide an account of the determinants of a behaviour. Health behaviour change interventions are more likely to be effective if they target causal determinants of behaviour (Michie et al., 2008). Theoretical models can guide the selection of these causal determinants. In contrast, change theories guide “the development and implementation of intervention strategies” (Green, pg. 125-126) that is how the determinants of behaviour can be manipulated effectively to change behaviour in a desired direction (Nation et al., 2003).

Basing interventions on theory allows predictions to be made about outcomes, and can be used to explain why an intervention is effective or ineffective (Achterberg & Miller, 2004; Green, 2000). If programs are not guided by theory, practitioners run the risk of unwittingly employing suboptimal procedures in the design and evaluation of the program (Ajzen, 1998; Green; Green et al., 1999). Suboptimal program design may lead to poor program outcomes (e.g., little change in attitudes or behaviours within the target population); and suboptimal evaluation may lead to errors in concluding that the program was a success or failure (Green). For example, concluding that the program itself was a failure when the program was designed and delivered inadequately or inappropriately (Type III error; Green et al., 1999). Although theory does not guarantee that a program will succeed, it may increase the chances of success by reducing the guesswork involved in program design. Further, theory can guide evaluation processes so reasons for poor outcomes can be identified and interventions can be modified accordingly.

Despite these sound reasons for using theory in the design of health behaviour change interventions, many government-funded programs are not theoretically-based (Johnston, 1995; Johnston & Dixon, 2008; Jones & Donovan, 2004). This is problematic as such programs may not have been optimally effective potentially resulting in poorer health outcomes for the target population. Ad hoc interventions based on researcher's intuition rather than theory could easily be based on erroneous causal assumptions leading to manipulation of factors which are only weakly, indirectly or spuriously related to behaviour change (cf. Johnston, 1995; Michie et al., 2008). Further, failure to utilise theory in health promotion practice means that even if researchers stumble upon an effective strategy for eliciting health behaviour change, it may be difficult to identify which factors were important for eliciting that change (Grimshaw et al., 2005; Michie et al.; Johnson et al., 2008). Therefore, such findings may offer little or no guidance to researchers hoping to replicate their methods. As such, cumulative knowledge may not be gained when theory is not used to guide behaviour change interventions.

However, the quality of an intervention guided by theory will only be as good as the theory itself. We currently do not have a full understanding of the psychosocial factors which motivate the uptake of healthy behaviours. For this reason investigating the determinants of health behaviour continues to be a burgeoning area of research. Several researchers continue to work at uncovering the psychosocial factors that determine health behaviour. A focus within this literature has been proliferating and testing theory. Theories of health behaviour are applied at a number of levels including the individual, interpersonal, group, environmental, organisation and community levels (Green, 2000; Noar & Zimmerman, 2005; Stokols, 1995). The focus here will be on the most prolific set of health behaviour theories (HBTs) – those focused on the individual

(Crosby, Kegler & DiClemente, 2002). The focus of these HBTs is the psychology of individuals with respect to key psychosocial predictors of health behaviour (e.g., attitudes, self-efficacy, perceived susceptibility, intentions; Nigg, Allegrante & Ory, 2002). Therefore, health behaviour theories attempt to identify the psychological factors which predict or determine health behaviour and how those variables relate and combine to optimise the prediction. These theories also suggest ways to motivate healthy behaviour change through the modification of key psychological factors (Achterberg & Miller, 2004).

Several theorists and researchers have investigated the effect of fear on persuasion and investigated its impact on health behaviours. There is currently a rich literature spanning sixty years investigating why fear appeals work and why they fail (cf. de Hoog et al., 2005, 2007, 2008; Janis & Feshbach, 1953; Leventhal, 1970, 1971; Peters, Ruiter & Kok, 2012; Rimal, 2001; Rimal & Real, 2003; Rogers, 1975, 1983; Witte,1992a; Witte & Allen, 2000). Theoretical models of fear and persuasion have been instrumental in guiding this research. The following is a critical review of the theoretical models which have been applied to explaining fear appeal outcomes and the evidence supporting these models.

Early Fear Appeal Research

Any examination of the extant fear appeal research should begin with the seminal research in the area, the Janis & Feshbach (1953) dental hygiene study. In this study high school students were randomly assigned to view one of three illustrated lectures concerning dental hygiene (low, moderate or high fear) or a control group which viewed no such message. The high fear appeal made several exaggerated references to pain from toothaches, possible secondary effects such as cancer, infections and blindness and the pain from dental work which would be required to correct the effects of poor dental hygiene. The moderate and low fear appeals were more factual and described the adverse effects of poor dental hygiene in a more measured manner. The high fear appeal contained 71 references to adverse consequences of poor dental hygiene when compared with the moderate appeal which contained 49 and the low fear appeal which contained 18. The high fear appeal lecture also contained several realistic photographs of severe tooth decay, the moderate appeal contained milder photographs of tooth decay and the low fear appeal contained x-ray images and diagrams.

Results of this research suggested that those exposed to the high fear appeal experienced greater worry about their dental hygiene when compared with the moderate, low and control groups. However, the low fear appeal group showed the greatest behaviour change following the lecture (at one week follow-up). The low fear appeal resulted in 36% of individuals conforming to the messages recommendations when compared with 22% for the moderate group and only 8% for the strong fear appeal (no change was observed for the control group). Other effects which were noted included the high fear appeal was identified as the most interesting of the three messages but was also associated with more negative responses about the message. There were no significant differences in the amount of information retained by each of the groups. It was concluded that the low fear message was the most effective for eliciting behaviour change.

Janis et al. (1953) concluded that the high fear appeal led individuals to engage in defensive avoidance which interfered with the acceptance of the messages recommendations. The high fear appeal evoked intense fear and worry about the effects of poor dental hygiene and this fear was not offset by the behavioural recommendations contained in the message. Therefore, the individuals resorted to other means of reducing the fear such as ignoring or minimising the threat. Further, it was argued that individuals will tend to avoid cues which are associated with negative emotions, especially intense negative emotions. As such, individuals may avoid thinking about the recommendations contained in the message as this would act as a cue evoking the fear associated with the health threat. This avoidance in turn had a negative effect on the adoption of proper dental hygiene practices. In support of this view, the high fear appeal was associated with more negative spontaneous responses from participants. These responses included disliking the content of the message, beliefs that the images were too gory or disgusting and not enough information addressing prevention of dental problems. These responses suggest that the high fear message was unpleasant for the participants which motivated them to engage in defensive avoidance as a coping strategy.

Drive Theories

The Janis et al. (1953) study was very influential and prompted a number of similar studies attempting to further investigate the effect of fear on persuasiveness. This research was guided by the drive theories of fear and persuasion (cf. Witte & Allen, 2000). The drive theories included the fear-as-acquired drive model (Hovland, Janis & Kelley, 1953) and the family of curves (Janis, 1967). When a noxious stimulus elicits fear an organism is motivated to avoid the noxious event – fear is unpleasant and its reduction is therefore reinforcing (cf. Hebb, 1946; Mowrer, 1950). Based on these behavioural principles the drive model posited that fear can be utilised to motivate individuals to engage in health protective behaviour. According to the model a respondent is likely to accept a fear appeal message's recommendations when: 1) it arouses a moderate amount of negative emotional arousal (i.e., fear) and 2) the suggestion of a recommended action immediately and effectively reduces an individual's fear (Hovland et al., 1953). The recommended response therefore becomes a reinforced response as it reduces fear about the health threat making it more likely to be adopted as a coping response.

However, when the fear is very intense the suggestion of the recommended response may fail to effectively reduce fear. When this occurs alternative defensive responses are adopted to reduce the negative emotional arousal. These alternative responses may include maladaptive responses such as derogating the message ("this message is exaggerated"), minimising the threat ("it's not that bad"), counter-arguing ("that won't happen to me because…") or simply ignoring the message altogether (cf. Janis, 1967; Janis et al., 1953; Janis & Terwilliger, 1962). The avoidant responses are reinforced and the recommended response is not adopted. Conversely, if no fear is elicited there is no motivation to adopt the recommended behaviour as there is no fear to be reduced. This theory fit Janis et al.'s (1953) findings very well as the low fear condition led to the greatest behaviour change; the high fear message led to the least behaviour change and was associated with defensive responses.

Although a few studies supported Janis et al's. (1953) findings that low fear messages lead to the greatest persuasion and behaviour change (e.g., Goldstein, 1959; Janis & Feshbach, 1954; Janis et al., 1962), results in the literature were mixed (Higbee, 1969). Some studies found no effect of fear message on persuasion (e.g., Frandsen, 1963; Millman, 1968). However, the overwhelming majority of findings supported a positive linear relationship between fearfulness of the message and persuasiveness (Higbee; Leventhal, 1971; Sternthal & Craig, 1974; Witte & Allen, 2000). Higbee reviewed twenty-seven early fear appeal studies; of these twenty-two were identified as finding support for the positive linear relationship (e.g., Chu, 1966; Dabbs & Leventhal, 1966; Haefner, 1965; Leventhal, Jones & Trembly, 1966; Leventhal, Singer & Jones, 1965). However, despite this apparent contradictory evidence Janis et al's. (1953) findings were very influential leading to unqualified scholarly acceptance of the contention that fear based health messages should be avoided as they lead to defensiveness (Higbee, 1969; Sternthal et al., 1974). More recent researchers have also lamented that the conclusions of Janis et al. study have been parroted by health educators as the definitive finding in the fear appeal literature, despite nearly all subsequent studies failing to support its conclusions (Green & Witte, 2006; e.g., DeJong & Winsten, 1990).

To account for the apparent disparity in findings several researchers proposed an inverted U-shaped curvilinear relationship between fear and message acceptance such that inducing moderate levels of fear was considered to be the most persuasive (see figure 2.1, e.g., Higbee, 1969; Janis, 1967; McGuire, 1968; Ray & Wilkie, 1970). In this view increasing fear from low (A) to moderate (B) should increase acceptance beyond the level elicited by a non-threatening message. However, at some (undefined) critical point (C) further increases in fear lead to less message acceptance (D). At a certain point (E) the acceptance of the fear appeal message is not different to a non-threatening message. Further increases in fear beyond this point (F) lead to detrimental outcomes, i.e., less effectiveness than a non-threatening message. At extreme levels of fear (G) message acceptance will be essentially 0.

Many individual studies in the literature are not designed to detect a curvilinear relationship (Higbee). This is because the vast majority of studies manipulated fear arousal across only two levels (Higbee; Sternthal et al., 1974). Nevertheless, it was argued that studies finding a positive relationship between fear and persuasiveness probably contained messages which induced lower levels of fear than in studies which found a negative relationship (Higbee; Ray et al.). Therefore, studies which found a

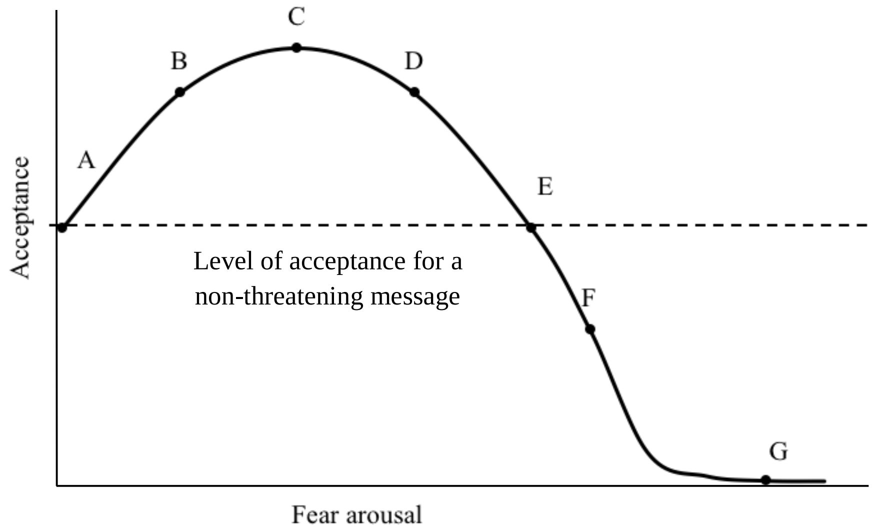

Figure 2.1. Depiction of the hypothesised curvilinear relationship between evoked fear and persuasiveness. Adapted from Higbee (1969) and Janis (1967).

positive relationship reflected the upward trend of the curvilinear model (A and B), and those which found a negative relationship reflected the downward trend (D and E). The curvilinear hypothesis could also explain findings which found no difference between fear appeal messages. In these cases the low fear message elicited a level of fear on the upward trend (B) of the curvilinear relationship and the high fear message elicited a level of fear represented by the downward trend (D). As such, the effect of fear on persuasiveness was ‘missed’ as each message elicited a level of fear on either side of the critical point (C). However, among those few studies which did manipulate fear across three levels, some found a positive linear relationship between fear message and persuasiveness (e.g., Chu, 1966; Dabbs et al., 1966; Leventhal et al., 1966) but only one found a negative linear relationship (Janis et al., 1953). None found that the moderate fear message was most persuasive. However, these seemingly contradictory findings could be explained by proponents of the curvilinear hypothesis (i.e., Ray et al.) by suggesting that the “moderate” threat message in these studies may not have represented the critical point (crest of the curvilinear relationship; C) where further increases in fear reduce the persuasiveness of the message.

The problems with the curvilinear interpretation of the literature were threefold. Firstly there was no way to compare the levels of fear elicited between studies. Separate measures and fear appeal messages were utilised in each study and different studies investigated different health problems and utilised different participant groups. This means that the assumption that studies which found a positive relationship elicited lower levels of fear relative to those which found a negative relationship was unable to be tested. There was no standardisation in the labelling of fear messages; as such what one study called a high fear message may have been equivalent to the moderate fear message of another study (Sternthal et al., 1974). There did not seem to be any obvious systematic differences between the fear messages contained in studies which found a positive relationship and those which found a negative relationship. Proponents of the curvilinear hypothesis offered no clear guidelines for judging the fear levels between studies (Higbee, 1969; Ray et al., 1970). Beck and Frankel (1981) argued that the levels of fear arousal reported in early experiments were similar and represented low to moderate levels – even for the high fear messages. This suggests that differences in elicited fear arousal cannot account for the inconsistent findings in the fear appeal literature.

Secondly the curvilinear hypothesis lacked specificity. It did not define the level of fear which corresponds to the critical point (C). Further it did not explain how to determine where the level of fear observed is with respect to this critical point. As such the model made no clear predictions and was unfalsifiable. Essentially if a given study found a positive relationship between fear and persuasiveness it would be assumed that the fear message elicited low levels of fear (predominately to the left of C). Whereas if the opposite pattern were found it would be assumed that higher levels of fear were elicited (Sternthal et al.). As such the model conveniently explained everything while offering no clear and testable predictions. As such the usefulness of the model was questionable.

A third problem with the curvilinear hypothesis was that it was not clear why the direction of the effect should change at a critical point (C); i.e., it is not clear what factor(s) moderate the effect of fear on persuasiveness. Janis (1967) proposed that critical factors moderating the effect of fear on persuasiveness were the attention the individual pays to the fear appeal message and defensive avoidance. When the fear aroused by a fear appeal message is very low individuals will dismiss the threat as inconsequential and will be less inclined to accept the message or pay it any attention. When fear arousal increases from low (A) to moderate (B) levels individuals pay more attention to the message and become motivated to take action to alleviate the health threat. However, at levels of fear beyond the critical point (D and E) individuals become motivated to alleviate the fear associated with the health threat. This is achieved through defensive avoidance reactions such as avoiding thinking about the threat or arguing with the messages conclusions (cf. Janis et al., 1953; Janis et al., 1962). This defensive avoidance interferes with message acceptance. Janis posited that extreme levels of fear (G) cause a cognitive overload characterised by marked reductions in attention, learning and comprehension capacity. This results in very poor message comprehension and as a result the message is not persuasive.

The defensive avoidance explanation did make intuitive sense and garnered some support, predominantly from those who forwarded the theory (e.g., Janis et al., 1953, 1954; Janis et al., 1962). However, most findings failed to support the predicted inverted-U shaped pattern (Higbee, 1969; Leventhal, 1971; Sternthal et al., 1974). No studies observed the hypothesised cognitive overload effect at very high levels of fear. Most studies found no effect of fear arousal on message information retention (Higbee; e.g., Janis et al., 1953; Goldstein, 1959). However, this may have been attributable to no studies successfully manipulating very high levels of fear (cf. Beck et al., 1981). Disconfirming evidence also came in the form of later studies which found no direct relationship between fear and persuasiveness (e.g., Maddux & Rogers, 1983; Mewborn & Rogers, 1979; Witte, 1994). Further studies provided false physiological feedback to participants regarding their fear arousal, finding that greater persuasion occurred under high perceived fear conditions, but independent of perceived fear reduction (e.g., Giesen & Hendrick, 1974; Hendrick, Gieson & Borden, 1975; Mewborn et al.). These findings served to disconfirm not only Janis' model, but the central prediction of the drive models as a whole – that the elicitation of fear and its subsequent reduction was the primary determinant of fear appeal persuasiveness (cf. Witte, 1992a).

Although Janis' (1967) model did attempt to answer the question of why the relationship between fear and persuasiveness should be curvilinear, it still did not address the remaining two objections. Janis acknowledged that his family of curves were difficult to falsify but argued that the model had value in that it was able to generate new predictions for testing. However, Rogers (1975) correctly stated: "it seems appropriate to question the utility of generating new hypotheses when it is impossible to disconfirm them" (pp. 107). The lack of empirical support and unfalsifiability of the predominant drive models prompted several researchers to reject them as explanations of fear appeal persuasiveness (e.g., Leventhal, 1970, 1971; Rogers, 1975; Witte, 1992a). As such, research guided by the drive models began to wane in the early 1970s (Witte & Allen, 2000).

Parallel Response Model

The formulation of the Parallel Response Model (Leventhal, 1970, 1971) represented a radical departure from early investigations into fear appeals. A core assumption of the early theorists was that fear and the reduction of fear motivated persuasion and action (Leventhal, 1971). The elicitation of fear was necessary to motivate action, and a recommended response was adopted only if its adoption was believed to reduce fear. Many research efforts were dedicated to exploring which factors moderated the effect of fear on persuasiveness (e.g., Chu, 1966; Janis et al., 1954; Leventhal et al., 1965). But the underlying assumption was that fear was the important factor which determined the persuasiveness of fear appeals. The Parallel Response Model rejected this assumption suggesting that threatening situations (including exposure to a fear appeal) elicit two parallel and largely independent processes simultaneously – danger control and fear control.

Danger control was directed at changing the environment in order to alleviate the threat. Danger control responses are attempts to problem solve the threatening situation and take effective action to overcome or reduce the threat. In contrast, fear control is directed at reducing the fear associated with the threatening situation. Fear control responses are attempts to avoid threatening stimuli in order to reduce fear; this may also help to motivate appropriate protective action – engagement in danger control processes. However, attempts to control the fear alone may also result in distracting activities, ignoring or otherwise not paying attention to the threat if these are effective in reducing fear (Leventhal, 1970, 1971). Although danger and fear control responses may in some cases result be very similar the motivation underlying each response is different. For danger control the motivation is derived from the desire to control or alleviate the threatening situation, whereas for fear control the motivation is to alleviate the fear associated with the threatening situation. As such, individuals in danger control engage are likely to engage in behaviour guided by rational problem solving whereas those in fear control engage in behaviour which is guided by their emotions.

Leventhal (1971) suggested that both fear control and danger control are parallel responses to threatening cues. This suggests that threatening cues produce both the motivation to control fear and the motivation to take protective action. Therefore fear is not the only factor motivating protective action and may not be a necessary part of the causal chain which leads to adaptive action (Leventhal, 1971). This was the key point of divergence between the parallel response model and the drive theories.

Leventhal (1970, 1971) related fear and danger control to Lazurus' (1966) primary and secondary appraisal of stressful events - stating that threatening situations elicit both unpleasant emotional arousal and consideration of coping options. During the primary appraisal individuals interpret a fear appeal message as either threatening or non-threatening. This primary appraisal was believed to be a precursor to both fear and danger control processes. Individuals evaluate the fear appeal through both their cognitive appraisal of the health threat and their emotional reaction to it. When a message is evaluated as threatening and it elicits negative emotional arousal it is interpreted as a valid threat. This prompts an appraisal of available coping resources (i.e., belief that particular response is effective, requisite skills, knowledge or support to adopt it). A cognitive appraisal of the available coping resources and emotional arousal serve as information in determining whether the recommended action will be adopted. If coping resources are appraised as high and emotional arousal is reduced then the recommended action should be adopted. High levels of emotional arousal are believed undermine one's perceived ability to cope with a threat (i.e., "if I was able to effectively cope with this threat I would not be so fearful") which may lead to one abandoning the recommended response in favour of maladaptive fear control responses. Leventhal, Safer and Pagnanis (1983) offered some further suggestions on how danger and fear control responses may interact. This interaction may be either “mutually interfering or mutually facilitating” (pp. 10). Accordingly fear control may interfere with danger control responses when ignoring a health threat effectively reduces the threat and engaging in protective action may lead to further increases in fear (e.g., obtaining an X-ray to check for lung cancer). However, when a simple response is effective in alleviating both the threat and the fear about the threat the fear-motivated response may be identical to the required protective action (e.g., brushing teeth for fear of the pain associated with tooth decay). Thus, according to the model fear control responses may have a interfering or facilitating effect on the adoption of protective behaviour depending on the circumstances. However, the circumstances under which each pattern of responding occurred was not clear. Leventhal et al. and Leventhal (1970, 1971) offered some examples but did not fully develop the psychological mechanisms determining each pattern of responding (cf. Rogers, 1975; Beck & Frankel, 1981; Witte, 1992a).

Leventhal failed to empirically test his model; but he did apply it to previous findings in the literature (1970, 1971). It was argued that several research findings which were not well accounted for by the drive theories were better explained by his model (e.g., Chu, 1966; Leventhal et al., 1965; Leventhal et al., 1966). For example, Chu found that students were more likely to ask for a pill to combat a parasitic worm when exposed to a high fear message (compared with moderate or low fear). They were also more likely to do so when they were led to believe that the pill was 90% effective (as opposed to 60% or 30%). The interaction effect between fear and effectiveness was non-significant. Leventhal argued that the drive theory would predict that effectiveness would moderate the relationship between fear and persuasion. A highly effective recommendation would alleviate the fear associated with the health threat whereas a less effective recommendation would not (leading to defensiveness). As no such interaction effect was found, Leventhal argued that Chu's findings lent greater support to his parallel response model. The high fear message increased motivation to take action and individuals were more motivated to adopt an effective action – Leventhal identified that this finding was predicted by the danger control aspect of his theory.

Perhaps, the main reason that Leventhal's (1970, 1971) parallel response model was not tested was that it failed to make specific and testable predictions (Beck & Frankel., 1981; Rogers, 1975). It stated that fear appeal messages will elicit two parallel processes but failed to clearly articulate either process or explain the circumstances which will determine when danger control or fear control will be dominant (Rogers; Witte,1992a; Witte & Allen, 2000). Leventhal (1971) did provide a number of examples of factors which may determine fear and danger control processes – anticipating several ideas from later models in the process (e.g., Protection Motivation Theory and the Extended Parallel Process Model; see below). He stated that factors such as the seriousness of the threat and its personal relevance should initiate both danger and fear control. Although these factors may elicit maladaptive avoidance reactions, they are necessary for individuals to accept the fear appeal as issuing a relevant threat. Once the threat has been accepted effective action is more likely if individuals are provided with effective actions that may alleviate the threat (cf. Chu, 1966) and specific instructions on how to adopt these actions (Leventhal et al., 1965). However, these were offered only as possibilities and they were not directly derivable from the model he proposed (Rogers). As such, it was not clear exactly how these factors related to fear control and danger control processes.

Ironically, many of the objections that had been levelled at the drive theories also applied to the parallel response model. Firstly it does not make specific claims and is thus unfalsifiable. Secondly like the various curvilinear hypotheses it is conveniently able to provide post hoc explanations of findings in the literature. For example, if a positive relationship is found between high fear messages and persuasiveness then participants must have been engaging in danger control, if a negative relationship is found then participants must have engaged in fear control. In a criticism of Janis' (1967) curvilinear model Leventhal (1970) stated "We may also wonder whether it is an explanatory and predictive model or strictly a post hoc descriptive schema" (pp. 161). It is strange that he failed to recognise that this criticism could be levelled at his 1971 work where he applied his parallel process model to a number of previous studies. It has been (correctly) argued that the supporting examples cited in Leventhal (1971) were simply him rationalising the findings in terms of his model (Rogers, 1975).

However, despite these limitations Leventhal's (1970, 1971) work was instrumental in guiding future developments in fear appeal theory. The parallel response model prompted researchers to consider that fear appeal outcomes are not simply determined by fear and factors which interact with fear. Leventhal suggested that fear is an inevitable by-product of a threatening message but this does not mean that it is fear that determines the persuasiveness of the message. In Leventhal's view what determines the persuasiveness of the action is actually a cognitive (as opposed to emotional) appraisal of the threatening information and the recommended response. However, it was stated that emotional appraisal of the fear appeal message may impact on the cognitive appraisal and vice versa, but it was not clear when or how this occurred. Subsequent fear appeal theory adopted this focus on the cognitive mediators of fear appeal outcomes. The parallel response model heavily influenced Rogers' (1975)

Protection Motivation Theory and Witte's (1992) Extended Parallel Process Model – which can each be seen as attempts to develop the parallel response model from a loosely defined conceptual framework into a bona fide theoretical model which makes specific and testable predictions.

Protection Motivation Theory

Rogers (1975) argued that fear appeal messages manipulate factors other than fear. Therefore, fear appeal researchers are often unwittingly manipulating several variables at once in their attempt to manipulate fear. As a result of this confounding effect it was difficult to ascertain which factors are important in increasing message acceptance and motivating health behaviour change. Although this issue had been noted by other researchers (e.g., Higbee, 1969; Leventhal, 1971), a theoretical account systematising these factors and how they may interact to predict message acceptance had (at the time) not been developed (Rogers). Rogers argued that this lack of specificity may account for the inconsistent findings in the fear appeal literature. Rogers heavily criticised the dominant fear appeal models at the time (i.e., Leventhal, 1970 and Janis, 1967) as not making clear predictions to guide future research and making untestable claims. He sought to create a testable fear appeal model which could be utilised to guide empirical research.

The result was Protection Motivation Theory (PMT) which posited that three important elements of fear appeal messages were: 1) the noxiousness of the health threat; 2) the probability of being affected by the health threat if no action is taken and 3) the effectiveness of the recommended response in reducing the health. Rogers was almost certainly influenced by the work of Leventhal (1971) who discussed the possible impact of these factors on fear and danger control processes. Rogers noted that several fear appeal messages used in research manipulated more than one of these factors simultaneously (e.g., Chu, 1966; Janis & Feshbach, 1953). Mediating the effect of each of these three message components on behaviour was a cognitive appraisal of each component. During this appraisal individuals developed perceptions of severity of the health threat depicted in the fear appeal message, their personal susceptibility to that health threat and the effectiveness of the response in alleviating the threat (what would later be termed response-efficacy). Rogers posited that these three factors (severity, susceptibility and response-efficacy) interacted to determine what he termed “protection motivation”. Protection motivation essentially referred to a motivation to protect oneself from the health threat depicted in the fear appeal message. Protection motivation was believed to be best measured by ones intentions to adopt protective actions (Prentice-Dunn & Rogers, 1986). In summary, PMT suggests that the health message determines the cognitions the individual has about the health threat, which in turn determines protection motivation and intentions.

The model posited that the persuasiveness of a fear appeal is not determined by the fear it elicits, but by the amount of protection motivation that results from the cognitive appraisal of severity, susceptibility and response-efficacy. A three-way interaction effect was predicted by the model such that protection motivation was believed to be highest when severity, susceptibility and response-efficacy were all high – this implies the main effects and two way interaction effects should also predict protection motivation (Rogers, 1975). However, if any of these factors were 0, no protection motivation would be elicited. This prediction made intuitive sense as individuals should be motivated to protect themselves from a health threat if it is severe, they are susceptible and they can take effective action to reduce the threat. However, individuals would not be motivated if the threat was perceived as trivial, completely irrelevant or no effective action could be taken. At the time that he posed the PMT Rogers had no data directly supporting its predictions. He did however apply his model to several previous findings (e.g., Dabbs et al., 1966; Leventhal et al., 1965; Chu, 1966; Rogers & Thistlethwaite, 1970) and argued that they supported the predictions of PMT. When findings did not conform to the predictions of PMT Rogers attributed these to the fear appeal message being confounded manipulating several constructs at once. However, the real strength of PMT was not its ability to explain past findings, but its testable predictions. Protection Motivation Theory was subsequently utilised to guide dozens of research projects testing its predictions.

Rogers and Mewborn (1976) manipulated severity, susceptibility and response efficacy in three parallel experiments. No support was found for the proposed three way multiplicative relationship. A main effect of response-efficacy on intentions was found such that a high response-efficacy message led to greater intentions to adopt health protective behaviour. Contrary to predictions no main effects of severity or susceptibility were found. Two way interactions were also found which suggested that both severity and susceptibility have a facilitative effect on intentions only when response-efficacy is high. This suggested that individuals are only likely to adopt a recommended response if it is perceived to be effective, lending support to findings by Chu (1966) and Rogers and Thistlethwaite (1970). When response-efficacy was low there was no effect of severity on intentions, but higher susceptibility led to less intention to adopt health protective behaviour relative to low susceptibility. This finding was indicative of a defensive response as it suggested that increasing perceptions of susceptibility to a health threat without offering an effective means of alleviating that threat led to rejection of the messages recommendations. These findings did not support the multiplicative combinational rule suggested by PMT. Other findings also failed to support this combinational rule (e.g., Griffeth & Rogers, 1976; Rogers, 1985). Rogers & Prentice-Dunn (1997) noted that the multiplicative combinational rule had never been observed in empirical studies. These negative findings prompted a rejection of the multiplicative rule and revisions of PMT.

Threat Control Theory

In a review of the fear appeal literature Beck and Frankel (1981) argued that what they termed “threat control” was the key factor which mediated the effectiveness of fear appeal messages. It was argued that the interaction effects observed in Rogers et al., (1976) occurred because individuals believed they were helpless to control the health threat. Threat control referred to the extent to which individuals believe they can control the health threat. It was argued that threat control moderates the response to a fear appeal message such that when threat control is low individuals are likely to engage in fear control responses (cf. Rogers et al.), whereas when threat control is high individuals are likely to adopt the recommended response or otherwise take action to alleviate the threat.

Threat control was believed to be consist of two processes: response-efficacy (as in PMT) and personal efficacy. Personal efficacy was essentially identical to Bandura’s (1977a, 1982) concept of self-efficacy and referred to an individual’s belief that they are able to effectively adopt the recommended response. It was reasoned that an individual may believe that a particular response (e.g., quitting smoking) will be effective in reducing their health risk (e.g., lung cancer; high response-efficacy), but they may feel they are incapable of quitting (low personal efficacy). In this case the individual would not quit smoking – despite believing that it would be effective in reducing their health risk – because they expect that any quit attempt will be unsuccessful. Although crude self-efficacy manipulations had been investigated in previous fear appeal research in the guise of “specific action instructions” (e.g., Leventhal et al., 1966; Leventhal et al., 1965; Leventhal, Watts & Pagano, 1967), Beck and Lund (1981) were the first to suggest its fundamental role in determining fear appeal outcomes. In the only empirical test of threat control theory, Beck et al. found that personal efficacy was the only significant predictor of intentions to floss, and severity and personal efficacy predicted actual flossing behaviour. Although this finding did not fully support threat control theory (effects of response-efficacy were non-significant), the finding did highlight that personal efficacy is an important determinant of health behaviours. For this reason threat control theory was very influential on the future development of fear appeal theory and research (e.g., Rogers, 1983; Sutton & Eiser, 1984; Witte, 1992a).

Revised Version of Protection Motivation Theory

In a revision of PMT (PMT-R) Rogers (1983) suggested that fear appeal outcomes are mediated by two appraisal processes – a threat appraisal and an efficacy appraisal. According to the model individuals can respond adaptively to a fear appeal message by adopting the recommended response (e.g., exercising regularly) or maladaptively by not adopting and continuing with their current behaviour (e.g., remaining sedentary). During the threat appraisal individuals evaluate the maladaptive response – evaluating the severity of the health outcomes that will result from maladaptive response and their probability of being affected (susceptibility). The intrinsic (pleasure) and extrinsic (e.g., peer approval) rewards associated with the maladaptive response is also considered such that one’s threat appraisal is the difference between the rewards and their appraisal of severity and susceptibility. Insofar as the severity of the threat and one’s personal susceptibility outweigh the rewards associated with the maladaptive behaviour the motivation to maintain the maladaptive behaviour should decline in favour of adopting the adaptive (recommended) response.

Similarly, during the coping appraisal, individuals evaluate the adaptive response with respect to how effective it will be in alleviating the health threat (response-efficacy) and their ability to adopt the recommended response (self-efficacy). Any costs associated with adopting the recommended response (e.g., monetary, time, physical exertion) are considered and deducted from appraisals of response- and self-efficacy to yield one's appraisal of coping. Insofar as response- and self-efficacy outweigh the costs associated with the adaptive response, the motivation to adopt the adaptive response will increase. In summary, individuals are likely to adopt the recommended response when they perceive a relevant threat and believe they can take effective action to alleviate that threat. This suggests that both the threat appraisal and coping appraisal should predict health intentions and behaviour.

This revised form of PMT generated much research attention. The vast majority of these research findings found main effects of at least one threat variable (e.g., Rogers & Deckner, 1975; Maddux et al., 1983; Wurtle & Maddux, 1987) and one efficacy variable (e.g., Maddux et al.; Rippetoe & Rogers, 1987; Rogers et al., 1976; Sutton & Hallett, 1989) on intentions in the predicted direction (see reviews by Prentice-Dunn & Rogers, 1986, Rogers, 1983 and Rogers et al., 1997). However, most research failed to measure rewards or costs (Rogers et al., 1997; see Campis, Prentice-Dunn & Lyman, 1989, Mermelstein & Riesenberg, 1992 and Self & Rogers, 1990 for some notable exceptions).

A review of the PMT-R literature reveals that the model as a whole explains between 20-56% of the variance in intentions and 19-46% of the variance in health behaviour (e.g., Bui, Mullan, & McCaffery, 2013; Hodgkins & Orbell, 1998; Maddux et al., 1983; Melamed, Rabinowitz, Feiner, Weisberg & Ribak, 1996; Plotnikoff & Higginbotham, 1995, 1998, 2002; Plotnikoff, Trinh, Courneya, Karunamuni, & Sigal, 2009; Rogers et al., 1976; Stanley & Maddux, 1986; Van der Velde & van der Pligt, 1991). Although these findings are impressive there is significant heterogeneity, and a large proportion of the variance in intentions and behaviour remains unexplained by PMT-R. Further, a consistent finding in the PMT-R literature is that the coping appraisal has a stronger effect on adaptive outcomes when compared with threat appraisal (e.g., Bui et al., 2013; Hodgkins et al.; Lippke & Plotnikoff, 2009; Milne et al., 2000; Plontikoff & Higginbotham, 1995, 1998, 2002; Plotnikoff, Rhodes & Trinh, 2009; Plotnikoff & Trinh, 2010; Plotnikoff, Trinh et al., 2009; Rogers et al., 1976; Ruiter, Verplanken, Kok & Werrij, 2003). In many cases the effects of severity or susceptibility on adaptive outcomes are found to be non-significant when controlling for the effects of response- and self-efficacy (e.g., Hodgkins et al.; Plotnikoff et al. 1995; Plotnikoff, Rhodes et al.; Plotnikoff, Trinh et al.; Ruiter et al.). This suggests that an individual's appraisal of their coping resources is more important in determining health behaviour than their appraisal of the health threat. Literature reviews in the domain of exercise behaviour have suggested that individual's coping appraisal (especially self-efficacy appraisal) is the most important predictor of exercise intentions and behaviour (Bui et al.; Plotnikoff et al., 2010). Evidence for the threat appraisal is weaker and inconsistent (Plotnikoff et al., 2010).

Threat * Coping Appraisal Interaction. In addition to the main effects of each of the predictor variables interaction effects were also posited. Rogers (1975) postulated a three-way interaction effect between each of the message appraisal variables (i.e., susceptibility, severity and response-efficacy). However, this higher-order interaction effect was not borne out empirically (e.g., Maddux et al., 1983; Rogers et al., 1976;

Wurtle et al., 1987). However, about half of the studies which investigated both threat and coping appraisals found that at least one threat appraisal variable (susceptibility or severity) interacted with at least one coping appraisal variable (response-efficacy or self-efficacy) in predicting intentions (cf. Prentice-Dunn et al., 1997; Witte & Allen, 2000; e.g., Kleinot & Rogers, 1982; Maddux et al., 1983; Rogers et al., 1976; Self & Rogers, 1990; Witte, 1992b; Wurtle et al., 1987). Thus, an interaction effect was predicted such that threat and coping appraisals will interact to predict protection motivation.

In most cases the interaction effects found were a “boomerang interaction” characterised by the high threat/high coping producing the greatest intentions to adopt the recommended action but high threat/low coping producing the least intention (Rogers et al., 1997; e.g., Kleinot et al., 1982; Rogers et al., 1976; Self et al., 1990; Witte, 1992a). An idealised depiction of this interaction effect using dummy data is presented in figure 2.2. It was stated that when the recommended response is believed to be effective, individuals will be more likely to adopt it as it will alleviate the health threat. However, when individuals do not believe that the response is effective they should be less inclined to adopt it than a perceived effective response. The predicted boomerang interaction has been found in several studies (e.g., Kleinot et al., 1982; Maddux et al., 1983; Rogers, 1985; Rogers et al., 1976; Self et al., 1990; Stephenson & Witte, 1998; Witte, 1992b; Witte et al., 1996; Wong et al., 2009). However, other findings have not found such an effect (e.g., Mewborn et al., 1979; Mulilis & Lippa, 1990; Plotnikoff & Higginbotham, 1995; Rippetoe et al., 1987; Rogers et al., 1970; Ruiter et al., 2003; Witte, 1992b). Even in cases where the interaction effect has been found the effect is not always consistent. For example Witte (1992b) found the predicted interaction effect for behaviour only, the interaction effect for attitudes and intentions was non-significant. Wong et al. found the effect for intentions to seek help in quitting smoking but did not for intentions to quit smoking. Prentice-Dunn et al. (1997) stated that the predicted interaction effect has been observed in around half of the cases in which it has been investigated. This suggests that although high threat/high efficacy often leads to more adaptive outcomes and high threat/low efficacy often leads to less adaptive outcomes, these effects are by no means consistent.

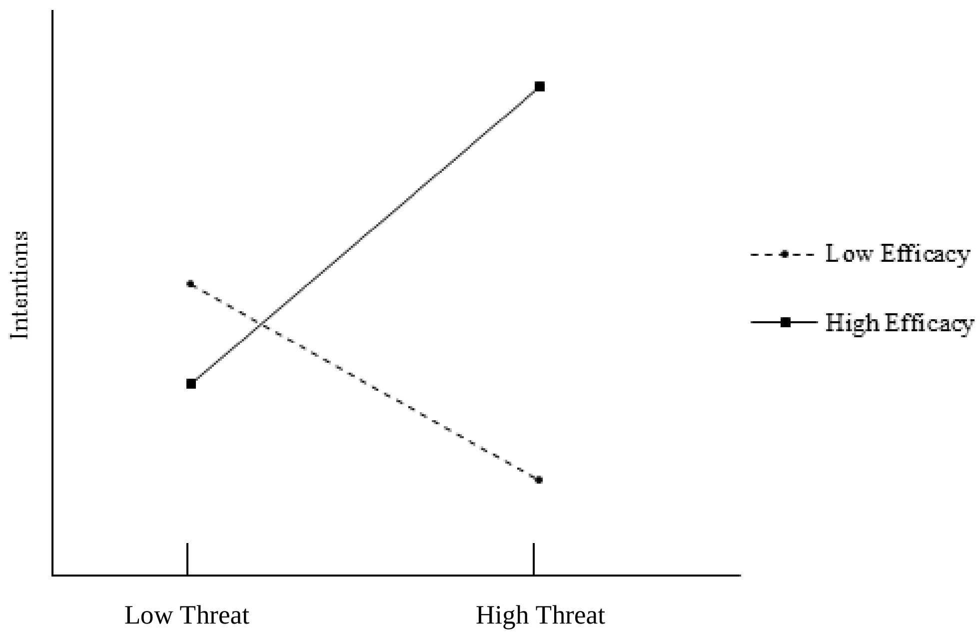

Figure 2.2. Example [using dummy data] of a typical boomerang interaction often observed in fear appeal experiments (cf. Kleinot et al., 1982; Rogers et al., 1976; Self et al., 1990).

However, as noted by Witte (1992) the authors of PMT-R offered no explanation of how or why the threat and efficacy appraisal constructs combine to influence protection motivation. As such, the predicted interaction effect was predictive but not explanatory. Although PMT-R predicted such an interaction effect (Prentice-Dunn et al., 1986; Rogers, 1983), there did not seem to be any credible attempt to explain why such an effect should occur. It was stated that when the recommended response is believed to be effective individuals will be more likely to adopt it as it will alleviate the health threat. However, when individuals do not believe that the response is effective they should be less inclined to adopt it than an effective response. This is an adequate explanation of why high threat/high coping should lead to the greatest intentions to adopt health protective behaviour. However, it would only predict that under conditions of low efficacy individuals would have low intentions to adopt the recommended response regardless of their appraisal of threat. It could not explain why people were even less inclined to adopt protective action if they were threatened compared with when they were not. As such, it appeared that the boomerang interaction prediction was made ad hoc to account for findings which would otherwise not be predicted by the model.

Criticisms of Protection Motivation Theory

The boomerang interaction prediction did not appear to be derivable from PMT-R (Witte, 1992a). Protection Motivation Theory predicts that increases in perceived threat should increase the likelihood of adopting a protective response. Therefore, threat and efficacy should combine such that high-threat and low-coping should result in greater persuasion than low-threat and low-coping (or the same if one believes that their ability to cope is absolutely 0 or costs are greater than response- and self-efficacy appraisal). Witte argued that the PMT-R was therefore logically inconsistent as it predicted that high threat will be associated with both greater and less persuasion. Thus, the boomerang interaction effect does not seem to be logically derivable from PMT-R. As such, PMT-R could not provide a satisfactory account of the boomerang interaction effect. The prediction made by Rogers (1983) was likely made to explain findings which did not conform to PMT’s predictions, rather than a logical consequence of the model as a whole.

Protection motivation theory was criticised as it essentially ignored fear as a determinant of fear appeal outcomes (Tanner, Hunt & Eppright, 1991; Witte, 1992a). This is despite the very robust finding that high fear or high threat messages impact on individual's ratings of fear (e.g., Janis et al., 1953, 1954; Leventhal et al., 1965; Leventhal et al., 1966; Maddux et al., 1983; Rogers et al., 1976; Rogers et al., 1970) and findings which suggest that fear is at the very least an important mediator of fear appeal message persuasiveness (e.g., Leventhal et al., 1965; Rogers et al., 1976; Sutton, 1982; Sutton et al, 1984; Sutton et al., 1989; Van der Velde & Van der Pligt, 1991). Research into PMT and PMT-R often measured fear but only as a manipulation check for the threat manipulation (e.g., Maddux et al., 1983) or as a control variable (e.g., Sutton et al., 1984). In some cases fear was not measured at all (e.g., Self et al., 1990). However, indirect effects of fear on intentions as mediated by severity have been found in PMT research (e.g., Rogers et al., 1976). Thus, according to PMT fear is a result of the threat appraisal but has no direct impact on fear appeal outcomes. However, individuals may be more likely to attend to a message which is threatening precisely because it evokes fear (cf. Lazurus & Folkman, 1984). As such, evoking fear may be fundamentally important as it motivates individuals to attend to the fear appeal message in the first instance. In support of this, Tanner et al. found that a high threat/coping message (which evoked greater fear) prompted greater learning than a low threat/coping message. This suggests that fear may have motivated individuals to attend to and process the information in the message. Strangely, no correlation between learning and fear was reported which would have lent greater credence to Tanner et al.'s claim that evoking fear motivates individuals pay greater attention to the message content. As such, these results are not conclusive as the effect found may have been due to variables associated with threat appraisal.

Leventhal (1970, 1971) argued that fear in addition to a cognitive appraisal of the threat cues may motivate individuals to seek protective action. In this view, fear may be instrumental in motivating individuals to attend to threatening cues and appraise their coping resources (cf. Lazurus et al., 1984). However, in Leventhal's conceptualisation fear often leads to maladaptive fear control responses. Nevertheless these are coping responses, albeit maladaptive ones. Thus, fear may motivate either adaptive or maladaptive coping responses.

Leventhal (1970) further argued that fear arousal may provide information concerning one's ability to cope with a threat. Accordingly when a fear appeal message elicits high levels of fear arousal an individual may tend to believe that they are less able to adopt the recommended response effectively. In support of this Sutton et al. (1984) reported a negative correlation between fear and confidence in succeeding in an attempt to quit smoking (similar to self-efficacy). When an individual believes that they are unable to cope with a threat they may engage in avoidant fear control responses as a means of reducing their fear. Such responses may interfere with the adoption of an effective protective response. This was confirmed by Rippetoe and Rogers (1987) who found a positive association between fear and defensive avoidance. Defensive avoidance in turn was associated with lower intentions to engage in regular breast self-examination. They also found that low response- and self-efficacy was associated with greater fear; similar to the previous findings of Kleinot et al., (1982). This suggests that the relationship between fear and perceived efficacy may be reciprocal with high levels of fear reducing ones perceived ability to cope with the threat and lack of belief in one's ability to cope leading to an increase in fear. Low response- and self-efficacy were associated with several maladaptive coping styles including the adoption of a fatalistic attitude, reliance on religious faith and perceived hopelessness. Self et al. (1990)

similarly found that low-coping appraisals produced maladaptive coping styles. These findings indicate that maladaptive forms of coping with a health threat are important moderators of fear appeal outcomes. However, PMT-R fails to specifically address maladaptive coping responses such as these and therefore offers no account of why these maladaptive responses should occur.

In summary, PMT-R can been criticised in at least three ways: 1) it does not explain the interaction between threat and coping appraisal and the common boomerang interaction finding (e.g., Kleinot et al., 1982; Rogers et al., 1976; Self et al., 1990); 2) it ignores the role of fear in determining fear appeal outcomes (cf. Tanner et al., 1991; Witte, 1992a); and 3) it does not adequately account for maladaptive and avoidant responses or how these interact with adaptive responses. Despite these limitations PMT and PMT-R constituted an important step forward in fear appeal research. It delineated the elements of a fear appeal message and offered testable predictions concerning how these elements should combine to explain when fear appeals are likely to be effective persuasive tools. A number of research findings confirmed the PMT-R's prediction that if individuals believe they are vulnerable to a severe health threat, but also believe they can adopt an effective response to alleviate that threat, they will be more likely to adopt this response (e.g., Kleinot et al., 1982; Maddux et al., 1983; Rogers et al., 1976; Rogers, 1985; Self et al., 1990). Rogers (1975) stated that PMT could be understood as a testable model of Leventhal's (1970) concept of danger control processes. The objections cited above could be interpreted as PMT's inability to account for fear control processes. Witte's (1992) Extended Parallel Process Model adopted many of the predictions of PMT-R but sought to also account for the fear control processes and defensive avoidance which were hypothesised by Leventhal and observed in the literature (Janis et al., 1953; Janis et al., 1962; Rippetoe et al. 1987).

Extended Parallel Process Model

The Extended Parallel Process Model (EPPM; Witte, 1992a) represents an amalgam of three earlier fear appeal theories: the drive theories, (e.g., Hovland, Janis & Kelley, 1953; Janis, 1967), parallel response model (Leventhal, 1970, 1971) and protection motivation theory (Rogers, 1975, 1983) and shares many similar features with each of these models. Witte (1992) argued that PMT-R was an adequate explanation of Leventhal's danger control processes. However, due to a lack of focus on fear within the model it failed to account for fear control processes (Witte). Therefore, it was suggested that PMT-R was a good account of why fear appeals work, but did not account for why they fail (Witte; Witte & Allen, 2000). Witte sought to explain both danger and fear control processes with a single model.

Witte (1992) theorised that fear appeals can result in either protective action (cf. Rogers, 1975, 1983) or defensive avoidance (cf. Janis et al., 1953; Janis et al, 1962; Janis, 1967). The EPPM adopted the assumption of PMT that fear appeal messages contain several components. According to the model, fear appeal outcomes are a function of how the message is appraised. This appraisal consists of a threat appraisal and an efficacy appraisal. These closely correspond to threat appraisal and coping appraisal respectively from PMT-R, except that rewards and costs were not incorporated into the EPPM. During the threat appraisal factors associated with the health threat, including feelings concerning the seriousness of a health threat (*severity*) and the likelihood of being affected (*susceptibility*) are evaluated. During the efficacy appraisal factors associated with the recommended response are evaluated including beliefs regarding the effectiveness of the recommended response in reducing the health threat (*response-efficacy*) and a conviction that they can succeed in performing the recommended response (*self-efficacy*; cf. Bandura, 1977a, 1977b, 1989; see Figure 2.3).

According to the EPPM, when a fear appeal message is appraised as trivial (low severity) or irrelevant (low susceptibility), no fear is elicited and there is no motivation to respond to the fear appeal or continue to attend to its message. Thus, low threat messages are unlikely to lead to adaptive behaviour change, regardless of the efficacy level (Witte, 1992a). However, when a health threat is appraised as harmful and relevant, fear is elicited (e.g., Maddux et al., 1983; Rippetoe et al., 1987; Rogers et al., 1976; Witte, 1992b, 1994; Witte & Allen, 2000). This fear motivates further message processing so the recommended response can be evaluated (efficacy appraisal; cf. Lazurus et al., 1984). The threat appraisal determines whether any response to the fear appeal message will occur. However, it is the efficacy appraisal which will determine the nature of the response (Maloney, Lapinski & Witte, 2011; Witte).

When the recommended response is believed to be effective in alleviating the health threat (high response-efficacy) and easy to perform (high self-efficacy) the individual should become motivated to protect themselves from the health threat and make an adaptive change in their health behaviour. These predictions were essentially identical to the predictions of PMT-R. Witte (1992) termed this pattern of responding danger control – adopting Leventhal’s (1970, 1971) terminology. Therefore, danger control responses occur when the individual is aware of a serious and relevant health threat (high threat) and believe they can take effective action to avert that threat (high efficacy; Witte, 1994). These cognitions stimulate message acceptance responses (i.e., intention and behaviour change; Witte & Allen, 2000). Witte noted that this pattern of responses was essentially identical to the PMT-R.

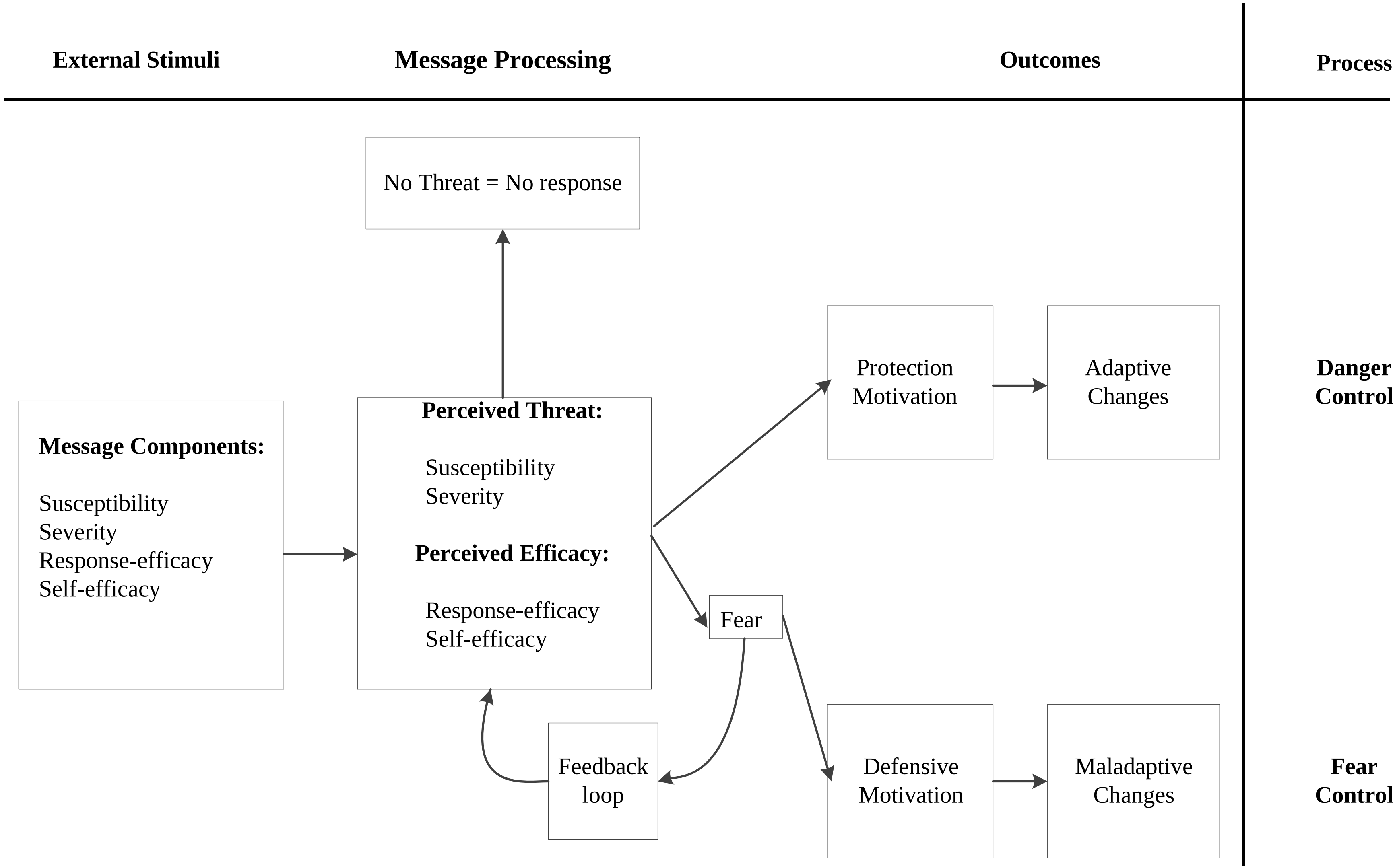

Figure 2.3. Conceptual diagram of the Extended Parallel Process Model. Adapted from Witte (1992b, 1994).

The EPPM suggests that when perceived threat is high, but perceived efficacy is low individuals will tend to engage in maladaptive responses. When this occurs the individual is in a state where they feel threatened but believe they cannot take effective action to alleviate the threat – the recommended response is deemed either ineffective in alleviating the health threat (low response-efficacy) or too difficult to adopt (low self-efficacy). This is believed to result in a further increase in fear resulting from the belief that the health threat is uncontrollable. As a consequence the EPPM suggests that since fear cannot be controlled through adoption of an effective action, it is controlled through maladaptive changes in their cognitions concerning the threat. These maladaptive changes make take the form of the individual viewer consciously or unconsciously avoiding thoughts about the danger (defensive avoidance), denying that the risk applies to them (denial), concluding that a fear appeal message is trying to manipulate them (reactance), derogating the message or simply ignoring the threat entirely (cf. Brehm, 1966; Brehm et al., 1981; Hovland et al., 1953; Janis, 1967; Janis et al., 1953, 1954; Janis et al., 1962). Such maladaptive responses interfere with the adoption of adaptive responses which would control the health threat, but nevertheless serve to reduce the fear associated with the health threat. Witte (1992a) termed these patterns of responding fear control – again adopting Leventhal's (1970, 1971) terminology. Therefore, the EPPM maintains that strong perceptions of threat must be counterbalanced by strong perceptions of efficacy; individuals must believe that the recommended action is efficacious enough to eliminate or substantially reduce the threat – otherwise they will engage in maladaptive fear control responses.

Witte (1992a) reasoned that fear control processes will begin to dominate over danger control processes at a "critical point" where perceptions of threat become greater than perceptions of efficacy (pp. 341; see also Witte, Cameron, McKeon & Berkowitz, 1996). At this point individuals believe that they cannot take effective action to alleviate the health threat (i.e., low perceptions of response- or self-efficacy). This leads to an overwhelming increase in fear which is unpleasant and thus motivates the individual to seek an alternative response which will reduce their fear. Therefore, they engage in maladaptive changes in their cognitions and behaviour such as denial of risk, reactance or defensive avoidance in order to reduce their fear. Conversely, so long as perceptions of efficacy exceed perceptions of threat individuals should adopt danger control responses and adaptive attitude, intention and behaviour change.

The EPPM offered a logical explanatory model of fear appeal outcomes. Where PMT-R failed to offer an explanation of the threat by efficacy interaction effect the EPPM offered an explanation. Perceived threat produces the motivation to take action and perceived efficacy determines the nature of that action, therefore according to the model both elements are necessary to determine fear appeal outcomes. It also provided a plausible explanation for the boomerang interaction effects observed in the PMT/PMT-R literature (e.g., Rogers et al., 1976; Self et al., 1990). According to the EPPM these effects could be explained by increases in fear resulting from the realisation that no effective action could be taken to alleviate the health threat. This in turn led to the adoption of maladaptive fear control processes which interfered with the adoption of appropriate protective responses. The EPPM also explained the maladaptive responses reported by Self et al., (1990) and Rippetoe et al., (1987) by appropriating and clearly specifying Leventhal's (1970, 1971) fear control processes. The explanation of fear control processes was also able to account for many of the earlier fear appeal research findings guided by the drive models – especially those findings pertaining to defensive avoidance responses (e.g., Janis et al., 1953, 1954; Janis et al., 1962). Therefore, the EPPM appeared to be a useful advancement of fear appeal theory as it generated several new predictions concerning how fear impacted on fear appeal outcomes (i.e., both danger and fear control responses) while retaining the empirically supported predictions of the PMT-R and the drive model.

Research Supporting the EPPM

The EPPM generated several novel, but intuitively appealing, predictions to guide research. Although not all of these predictions have been supported, research investigating the EPPM has at least partially supported its predictions. This research generally adopts a similar methodology to that investigating the PMT-R. Levels of message threat and/or efficacy are manipulated and the effect of the experimental manipulation on attitudes, intentions and behaviour is investigated (e.g., Cho, 2003; Witte, 1992b; Witte, 1994).

Meta-analyses.

Meta-analytic reviews of the EPPM and PMT-R have found that threat and efficacy messages have the predicted impact on perceptions of fear, severity, susceptibility, response-efficacy and self-efficacy (Milne et al., 2000; Witte & Allen, 2000). Witte et al. also found weak positive associations between threat and coping messages and message consistent attitudes (*r*s between .12 and .15), intentions (*r*s between .13 and .17) and behaviours (*r*s between .13 and .16). Across multiple studies the main effect of threat message explained 22% of the variance in adaptive responses, coping messages explained 13%. Peters et al. (2012) found that high threat messages only had an effect on behaviour under high efficacy conditions, and high efficacy messages only had an effect under high threat. These findings lend support to the predictions of the EPPM and PMT-R. However, much of the variance in adaptive responses was not explained by health message content alone.

Milne et al's. (2000) meta-analysis also investigated the effect of perceptions of severity, susceptibility, response-efficacy, self-efficacy and fear on intentions, concurrent behaviour and subsequent behaviour. It was revealed that each of the variables had positive associations with intentions. However, the correlations for threat appraisal variables (severity: r = .10; susceptibility: r = .16) were weaker than for the coping appraisal variables (response-efficacy: r = .29; self-efficacy: r = .33), the weighted sample average correlation or fear was .20. Both threat appraisal (severity: r = .10; susceptibility: r = .13) and efficacy appraisal (response-efficacy: r = .17; self-efficacy: r = .36) variables were predictors of concurrent behaviour; both fear (r = .26) and intentions (r = .82) were also predictors. Only perceptions of susceptibility (r = .12), self-efficacy (r = .22) and behavioural intentions (r = .40) were found to predict subsequent behaviour. These findings suggest that although each of the EPPM/PMT-R variables are important to the prediction of intentions and behaviour, variables related to individual's efficacy appraisal may be more important predictors than threat appraisal.

The bivariate correlations reported in these meta-analytic reviews only inform us about the relationships between individual predictors and adaptive outcome variables, they do not test the EPPM as a whole. More specific predictions of the EPPM have been investigated using individual studies. Further, the EPPM makes predictions concerning maladaptive outcomes. As such, variables such as defensive avoidance, perceived manipulation and message derogation are measured in order to investigate under what conditions these fear control responses are most likely to occur. Witte (1992a) lists the specific predictions of the EPPM; the evidence for these predictions follows. The pertinent predictions of the EPPM and the rationale for these predictions in terms of the model are summarised in table 2.1.

Prediction 1.

Several findings indicated that, as predicted, threat and efficacy messages led to greater perceptions of threat and efficacy (e.g., Cho, 2003; Cho & Salmon, 2006; Maddux et al., 1983; Rogers et al., 1976; Ruiter, Verplanken, Kok & Werrij, 2003; Self et al., 1990; Witte, 1992a, 1994; Witte, Berkowitz, Cameron & McKeon, 1998; Witte & Morrison, 2000). However, there are rare findings which suggest that these messages fail to change perceptions of threat and efficacy (e.g., Wong & Cappella, 2009). This indicates that there is strong evidence that messages which contain relevant and serious health threats lead to greater perceptions of threat; and messages which suggest that a particular response is effective in alleviating the health threat lead to greater perceptions of efficacy – supporting prediction 1 (see table 2.1).

Prediction 2.

Evidence for prediction 2 was provided by Witte et al., (1998) who separated participants who reported low perceived threat from those who reported high perceptions of threat. For low threat participants, there was no difference between those who were exposed to a high threat fear appeal message and those who were not exposed to any message in terms of either adaptive or maladaptive responses. Further, Wong and Cappella (2009) found that individuals exposed to a low threat message did not differ in their intentions to quit smoking or seek help in quitting smoking as a function of the efficacy message they viewed. This suggests that those who perceive low threat as a result of viewing a fear appeal message will not respond to that message – supporting prediction 2.

Prediction 3.

In a meta-analysis of fear appeal research, Peters et al., (2012) found that under conditions of high efficacy, threat messages had a positive effect on behaviour, but under low efficacy conditions the effect was predominately negative – supporting prediction 3. An underlying assumption of prediction 3 is that under low efficacy conditions maladaptive responses are elicited when threat is high (due to the increased fear elicited). This prediction was supported by Stephenson et al. (1998) who found that under low efficacy conditions high threat was associated with greater perceived manipulation and message derogation (but the effect on defensive avoidance was non-significant). Cho (2003) found a similar effect for message derogation but not perceived manipulation. Other findings suggest that low efficacy alone is associated with maladaptive responses (e.g., Fruin, Pratt & Owen, 1991; Rippetoe et al., 1987; Ruiter et al., 2003; Self et al., 1990). This suggests that the boomerang effect when efficacy is low may be due to maladaptive responses.

Prediction 4.

Prediction 4 states that adaptive and maladaptive outcomes of fear appeals should be negatively associated. In support of this prediction Ruiter et al., (2003) found that message derogation, perceived manipulation and defensive avoidance were each negatively correlated with attitudes as predicted. However contrary to predictions, none of these were associated with intentions. Witte (1992b) found that defensive avoidance was negatively associated with attitudes, intentions and behaviour change. Message derogation was found to be negatively associated with attitudes only. Contrary to predictions perceived manipulation was positively related to behaviour change.

Table 2.1.

Predictions of the EPPM and the Reasoning Behind these Predictions

Prediction[a]	**Reasoning[a]**
1. Threatening messages increase perceptions of threat; messages with a high efficacy message increase perceptions of efficacy.[1]	When a fear appeal message depicts a health threat which is both severe and relevant, individuals should process the message and naturally conclude that they are susceptible to a severe threat. Similarly when a message depicts a response which is both effective in alleviating the health threat and relatively easy to adopt, individuals should naturally conclude that the recommended response is a viable solution to the health problem depicted.
2. When perceived threat is low no response (adaptive or maladaptive) will result from the fear appeal message.[1]	If individuals perceive no relevant health threat they have no reason to adopt protective or defensive responses. They simply ignore the message and do not respond to it with any measurable behaviour change.
3. Perceived efficacy moderates the effect of high perceived threat on protective responses (attitude, intention and behaviour).[2] a. Protective responses are more likely to occur under high efficacy conditions. b. Protective responses are less likely to occur under low efficacy conditions.	a. Under these conditions individuals have accepted a relevant and serious health threat and believe they are capable of taking effective action to alleviate that threat. The will therefore adopt the logical response and accept the message's conclusions, adopting message consistent attitudes, intentions and behaviours. b. Individuals acknowledge a relevant and serious health threat but believe that no effective action can be taken to alleviate that threat. This leads to a further increase in fear which becomes overwhelming and elicits a motivation to reduce that fear. As no protective response is available individuals resort to defensive responses (e.g., denial, minimisation, ignoring the message, reactance) in order to reduce their fear. These defensive responses interfere with the adoption of protective responses such that these responses become less likely.
4. A negative linear relationship exists between adaptive (danger control) responses and maladaptive (fear control) responses.[2]	Adaptive (attitude, intention and behaviour change) and maladaptive (denial, reactance, defensive avoidance) responses are opponent processes. When individuals are engaging in defensive avoidance they are not intending to change and vice versa.
5. Fear is positively associated with maladaptive responses.[2]	The adoption of maladaptive responses is motivated by their ability to reduce fear arousal.
6. The effect of threat on maladaptive responses is mediated by fear.[3]	Although threat is correlated with fear, maladaptive responses are motivated by fear arousal not by a desire to alleviate the health threat. Therefore an indirect path between threat and maladaptive responses is postulated.
7. Efficacy is unrelated to maladaptive responses.[3]	Because efficacy is unrelated to fear, and fear is the determinant of maladaptive responses.

[a]Adapted from Witte (1992) and logical consequences of the model as described. [1] Prediction generally supported by the available evidence. [2] Support for the prediction is inconsistent or findings are mixed. [3] Little or no support for prediction, disconfirming evidence outweighs confirming evidence.

Rippetoe et al., (1987) also found a negative association between defensive avoidance and intentions to engage in breast self- examination. In a meta-analysis of the fear appeal literature Witte and Allen (2000) found that defensive responses show a weak negative correlation with adaptive responses (r = -.18). Therefore the negative association between adaptive and maladaptive responses to fear appeals is generally supported by the available evidence but there are inconsistent findings.

Prediction 5.

Research has generally found that fear is associated with maladaptive outcomes. Ruiter et al. (2003) found that fear was positively associated with message derogation and perceived manipulation but was not associated with defensive avoidance. Witte (1994) found that fear was positively associated with perceived manipulation. However, contrary to predictions the associations for defensive avoidance and minimisation of personal risk were negative. Similarly, Abraham, Sheeran, Abrams and Spears (1994) found that fear was negatively associated with denial as a coping strategy but was not associated with fatalism or wishful thinking. These findings suggest that engaging in defensive avoidance and minimisation of risk not only leads to a reduction in adaptive responses but may also serve to reduce fear – i.e., because individuals were defensively avoiding the threatening message content their fear was reduced. Therefore in a roundabout way this finding may be logically consistent with the predictions of the EPPM. This suggests that the support for prediction 5 is mixed.

Prediction 6.

Prediction 6 has not been formally tested in the fear appeal literature. However, several findings have reported positive relationships between fear and maladaptive responses (e.g., Ruiter et al., 2003; Witte, 1994; see above paragraph). Cho et al. (2006) found that high threat messages were associated with greater fatalism, hopelessness, and wishful thinking; however it was not tested whether these effects were mediated by perceived fear. Witte (1994) found that threat was negatively correlated with risk minimisation and defensive avoidance. Witte and Allen (2000) reported a positive relationship between intensity of threat message and maladaptive responses. However, in both cases no mediation analyses were performed to explore whether fear mediated this effect. A rare exception is Abraham et al., (1994) who utilised path analysis to test the predictions of PMT-R. Although not strictly speaking a fear control response, Abraham et al. (1994) found that individuals who perceived themselves to be susceptible to HIV infection were more likely to endorse homophobic attitudes. This effect was direct and not mediated by fear (which had no effect on homophobic attitudes). Nevertheless on the basis of this evidence it would be premature to comment on the veracity of prediction that the effect of threat on fear control processes is mediated by fear.

Prediction 7.

Prediction 7 states that perceived efficacy is unrelated to maladaptive responses. In support of this prediction Witte (1994) found that perceived efficacy was not associated with risk minimisation, defensive avoidance or perceived manipulation. However, several findings have found that that low response- and self-efficacy messages are associated with greater maladaptive coping responses (e.g., adoption of a fatalistic attitude, reliance on religious faith, denial, and perceived hopelessness; e.g., Abraham et al., 1994; Fruin et al., 1991; Rippetoe et al., 1987; Self et al., 1990). Ruiter et al. (2003) also found that perceived efficacy was negatively associated with defensive avoidance, message derogation and perceived manipulation. Witte and Allen (2000) found that the weaker the efficacy message the greater the defensive responses. Contrary to prediction

7, these findings suggest that efficacy is negatively associated with maladaptive outcomes.

Witte's (1992) prediction that efficacy is not associated with maladaptive responses appears to be inconsistent with the models description of fear control processes. According to the EPPM maladaptive responses should be more likely to occur under low efficacy conditions. As such, it would seem unsurprising that efficacy is negatively associated with maladaptive responses. However, this negative association may be moderated by perceived threat, as maladaptive responses are most likely to occur under high threat/low efficacy conditions. Therefore, Witte's (1992) prediction that efficacy is not at all associated with maladaptive responses may have been overly simplistic.

Further Theoretical Developments in Fear Appeal Research – The Stage Model and Risk Perception Attitude Framework

The EPPM has been utilised as a framework for other models including the Stage Model (Das, de Wit & Stroebe, 2003; de Hoog et al., 2005, 2007, 2008) and the Risk Perception Attitude Framework (RPA; Rimal, 2000, 2001; Rimal & Real, 2003). According to the Stage Model, a key mediator of fear appeal outcomes is the manner in which the information is processed and the processing goals of the individual. The RPA states that perceptions of threat and efficacy may be generated by the individual as a function of their past beliefs and history not only in response to a fear appeal message. These models have generated further predictions which may be incorporated into the EPPM in order to increase its explanatory and predictive power.

Dual Process Theories of Persuasion

A criticism which may be levelled at the EPPM is that it does not emphasise how health messages are processed by respondents (Ruiter, Abraham & Kok, 2003). The EPPM certainly makes some (tacit) assumptions concerning how the fear appeal message is processed. For example, it is predicted that perceptions of threat will motivate individuals to attend to and process the message. Further, during fear control individuals may avoid thinking about the threatening message or derogate the message arguments (Witte, 1992a). These assumptions may be overly simplistic, and they are to a large extent predictive but not explanatory. They predict the outcomes of cognitive processing of the message, but fail to give a compelling account of what determines these outcomes – specifically how is fear appeal information processed? And how does the mode of processing impact on the persuasiveness of the message. Dual-Process theories of attitude change such as the Elaboration Likelihood Model (ELM; Petty & Cacioppo, 1986) and the Heuristic-Systematic Model (HSM; Chaiken, Liberman & Eagly, 1989) suggest that there are multiple routes to persuasion and the mode of processing will be determined by the capacity and motivation one has to process the message.

Although the ELM and HSM use different jargon, they make quite similar predictions (Petty, Wegener & Farbrigar, 1997). Both propose two distinct information processing modes, one superficial (heuristic or peripheral processing) the other deeper and more effortful (systematic or central processing). Heuristic processing is characterised by the use of peripheral aspects of the message and ‘rules of thumb’ (heuristics) to determine message-relevant attitudes. Individuals using such heuristics may assume that the conclusions of the message are valid because they are provided by an expert, backed up by statistics or representative of a general consensus. Individuals processing a message heuristically may also be persuaded by message features such as how likeable or attractive the presenter is (Chaiken, 1980), the perceived expertise of the source (Petty, Cacioppo & Goldman, 1981) or how many issue-relevant arguments are made (e.g., Petty & Cacioppo, 1984; Chaiken et al., 1989). When processing a persuasive message heuristically individuals use “decision rules” such as “experts’ statements can be trusted”, “statistics don’t lie” and “consensus implies correctness” in order to judge the strength of the message arguments (Chaiken et al., 1989 pp. 216; see also Eagly & Chaiken, 1993). As such, individuals processing a message heuristically pay little attention to the actual message content or the validity of its arguments; they simply use mental short cuts to formulate a conclusion. The strength of the arguments has little bearing on persuasion for a message which is heuristically processed.

In contrast, systematic processing is characterised by detailed, critical and effortful processing of the relevant message content. Individuals engaging in systematic processing evaluate the validity of the arguments on the basis of their strength, logic and evidence. The message content is also related to any relevant information the individual already has on the topic. If the individual has a good general knowledge about a topic they will be in a better position to analyse the validity of the message in light of that knowledge. As such, persuasion occurs as a function of the strength of the arguments contained in the message and prior issue-relevant knowledge rather than peripheral features of the message as in heuristic processing (Chaiken, 1980; Chaiken et al., 1989; Petty & Cacioppo, 1979). According to earlier versions of the HSM both heuristic and systematic processing can (but do not always) operate in unison. Both modes of processing individuals have the goal of assessing the veracity and validity of a piece of information to guide the formation of accurate attitudes (Chaiken et al., 1989). However, attitude change as a result of systematic processing has been found to be more persistent, temporally stable and resistant to counter-persuasion than persuasion based on heuristic processing (e.g., Chaiken, 1980; Griffin, Dunwoody & Neuwirth, 1999). This makes sense as engaging in a systematic form of information processing should lead to a greater general knowledge of the issue-relevant facts and thus increased ability to analyse and reject spurious information which counters a well-founded position. In contrast, individual's confidence in their attitudes based on heuristic processing may be easily undermined when presented with incongruent information (cf. Maheswaran & Chaiken, 1991), as individuals lack the capacity to argue their previously held position. Therefore, if a health promotion message is processed heuristically, any positive attitude change which results could be undermined by a well-liked friend presenting contrasting information or a piece of contradictory health information. As such, health promotion should aim to motivate attitude change via systematic rather than heuristic processing (cf. Griffin et al.).

A problem for health promotion practitioners is that both dual process theories assume that humans are cognitive misers and will engage in the least effortful means of processing health messages unless motivated to do otherwise (cf. Chaiken & Stangor, 1987; Chaiken et al., 1989; Petty et al., 1986). Therefore, heuristic message processing will be preferred unless individuals are provided with the requisite motivation to engage in systematic processing. This assumption makes sense as we would waste a lot of time and energy if we engaged in a detailed analysis of every piece of information that we encountered each day. We would spend a lot of time processing information that is not useful or relevant to us. Thus, the development of a cognitive filter is necessary whereby important information is systematically processed and less important or irrelevant information is heuristically processed or ignored. Accordingly, the dual process theories posit that humans have a cognitive filter which filters out all the less relevant information we are presented with freeing resources to process information which is relevant and useful to us.

Individuals engaging in systematic processing of a message are generally more sensitive to manipulations of argument quality, recall greater amounts of issue relevant information, spend more time reading the message and generate more cognitions relevant to the message on a thought listing task (e.g., Chaiken, 1980; Chaiken et al., 1989, Petty et al., 1979, 1984; Petty et al., 1981). This is because they have taken the time to consider the content of the message arguments and for a cohesive judgement on the basis of these. A consistent finding in the literature is that messages which are involving are more likely to be processed systematically (e.g., Chaiken; Das et al., 2003; Griffin et al., 1995; de Hoog et al., 2005, 2007, 2008; Petty et al., 1979, 1984; Petty et al., 1981; Petty, Cacioppo & Schumann, 1983). Involving messages are both relevant and important to the individual. For example, Petty et al. (1981) presented university students with a message advocating a comprehensive final exam requirement for graduation. Half of the participants were told that the change would come into effect next year (high involvement) the other half were told the change would take effect in around ten years (low involvement). The expertise of the source and the quality of the arguments was also manipulated. It was found that highly involved participants were more persuaded by the strong rather than weak arguments; source expertise had no effect. However, the opposite pattern was found for low involvement participants. Message recall was also greater for high involvement participants. This suggests that personal relevance motivates individuals to engage in systematic message processing.

It has been argued that a threatening health message is involving as it depicts a severe (i.e., important) and relevant health threat and as such should motivate systematic message processing (Baron, Logan, Lilly, Inman & Brennan, 1994; Liberman & Chaiken, 1992; de Hoog et al., 2007). In support of this view Baron et al., (1994) found that dental patients who listened to a fearful message concerning dental practices were more persuaded by strong arguments in favour of fluoridated water. Those who listened to a non-fearful message showed similar persuasion for strong and weak arguments. This suggests that threatening messages induce systematic information processing.

However, there is evidence to suggest that the processing of threatening information may be a special case leading to defensively biased processing of information. The HSM suggests that individuals may be motivated to reach an accurate conclusion, defend a preferred conclusion or reach a socially desirable conclusion (cf. Chaiken et al., 1989; Chaiken, Giner-Sorolla & Chen, 1996; Chen & Chaiken, 1999). It is believed that the defence-motivated individual's processing goal is to reach a preferred conclusion. Information which is consistent with a preferred conclusion is judged as more valid than inconsistent information (Ditto & Lopez, 1992; Kunda, 1990). This is achieved by defensively biased individuals being more critical of information which is inconsistent with their preferred position, but uncritically accepting consistent information. Individuals may also selectively attend to information confirming their preferred position and selectively ignore information which is disconfirming (Chaiken et al., 1989). Therefore, the defensive processing mode ensures that individuals are much more likely to reach their preferred conclusion. Several studies have shown that individuals are more critical of threatening health information than less threatening information (e.g., Ditto et al., 1992; Janis et al., 1962; Keller, 1999; Kunda, 1987; Liberman et al., 1992). For example, Liberman et al. (1992) found that female coffee drinkers were more critical of messages proposing a link between fibrocystic disease and coffee drinking compared with non-coffee drinkers. This effect remained regardless of how threatening the message was. It was found that the coffee drinkers were more critical of arguments in favour of the link and less critical of arguments which questioned the link. Therefore, their processing style was defensively biased, favouring their preferred conclusion that they were not more susceptible to fibrocystic disease as a result of their coffee drinking. As a result, coffee drinkers were less persuaded by the messages.

Stage Model

The Stage Model draws on the predictions of the dual process theories of persuasion in order to explain how fear appeal information is processed (Das et al., 2003; de Hoog et al., 2005, 2007, 2008). It attempts to describe the conditions under which a fear appeal message will motivate systematic and heuristic processing, and how the manner of information processing determines fear appeal outcomes. It is suggested that when a health threat is appraised as non-serious (low severity) and irrelevant (low susceptibility) there is little motivation to expend effort in processing the message. The message will thus be processed heuristically. When an individual believes they are susceptible to a non-serious danger they should be motivated to systematically process the message; as the message is nevertheless relevant to the individual. Similarly, when an individual believes they are not susceptible to a serious danger the Stage Model suggests that they should also be motivated to systematically process the message. In both cases individuals should be motivated to reach an accurate conclusion as feeling susceptible to a non-serious threat should not elicit defensiveness as the health threat is perceived as trivial. When a threat is severe but there is no personal risk it is still important to gather accurate information about a health problem as this may help the individual prevent themselves from being affected (de Hoog et al., 2007). As such it is important to gather accurate information about the health threat. Therefore according to the Stage Model higher levels of both perceived susceptibility and severity motivate systematic and objective message processing (de Hoog et al., 2007, 2008).

The main aim of the Stage Model is to explain what happens when a fear appeal message elicits feelings of vulnerability to a serious risk. This state arouses defence motivation as the threatening health information is inconsistent with an individual's reassuring preferred belief that they are healthy. Therefore, this state motivates systematic but defensively biased processing of the threatening health information (Stage 1). The processing is by definition systematic as it involves a thorough evaluation of the message arguments and the persuasiveness of the message is judged on the basis of its arguments. However, the processing is biased as the individual wants to maintain their preferred conclusion that they are a safe and healthy individual. Instead of assessing the message arguments objectively evaluating each on its merits, it is suggested that defensively-biased processing involves a biased search for disconfirming evidence, inconsistencies or other ways to criticise and invalidate the threatening message's conclusions (cf. Ditto et al., 1992; Kunda, 1990; Liberman et al., 1992). This biased message processing should have the effect of reducing perceptions of threat and fear. However, even biased processing is subject to evidence and the rules of inference (cf. Kunda, 1987). Therefore, if the arguments presented in the threat message are persuasive and thus resistant to counterargument, individuals will be forced to accept they are personally at risk (Das et al., 2003). The Stage Model predicts that when individuals are unsuccessful in invalidating a threatening message through biased processing, they will become motivated to accept any action which may reduce their risk (de Hoog et al., 2007, 2008).

When appraising the recommended response of a fear appeal message (Stage 2), it is believed that defence-motivated individuals will be motivated to accept that the recommended response is effective. The reasoning behind this is that such beliefs should reassure the individual that something can be done to reduce their risk of harm.

Processing of the recommended response will continue to be systematic, but should now have a positive rather than negative bias. Individuals are believed to engage in a biased search for evidence in favour of the recommended response. As a result of this biased search, defence-motivated individuals should accept any plausible recommended response regardless of the quality of the arguments supporting its effectiveness (de Hoog, et al., 2007, 2008).

The EPPM makes identical predictions concerning attitudes, intentions and behaviour (i.e., each are determined by the combination of high perceptions of threat and efficacy; cf. Witte, 1992a). In contrast, the Stage Model makes different predictions concerning the determinants of attitudes and intentions and behaviour. The model suggests that individuals will only engage protective behaviour (or intend to do so) if they feel susceptible to the health risk. It is reasoned that there would be no motivation to expend effort in adopting a response if there was no risk. It was also suggested that perceptions of severity may moderate the effect of susceptibility on intentions and behaviour, such that individuals should be more inclined to engage in protective action for a severe health risk when compared with a less severe risk.

In support of these predictions several findings indicate that high perceptions of susceptibility have been consistently found to predict intentions and behaviour (Das et al., 2003; de Hoog et al., 2005, 2007, 2008; Floyd et al., 2000; Milne et al., 2000), however the effect sizes were quite small (*d*s between .33 and .41). Argument quality was found to have no effect on intentions or behaviour (Das et al.; de Hoog et al., 2007). However, contrary to predictions meta-analyses of relevant research revealed that perceived severity has a weak but reliable impact on intentions and behaviour (e.g., de Hoog et al., 2007; Floyd et al.; Milne et al.). The predicted severity-susceptibility interaction was not borne out by the evidence (de Hoog et al., 2007). These findings lend partial support to the predictions of the Stage Model, however perceptions of severity were found to have a main effect on intentions and behaviour rather than interacting with susceptibility as predicted.

The Stage Model makes different predictions concerning attitudes. It is argued that attitudes do not necessarily have behavioural implications (i.e., you can hold a positive attitude about some protective action without engaging in that action), they simply reflect an objective evaluation of the message arguments in favour of the protective action (de Hoog et al., 2005, 2007). Therefore, it is predicted that perceived quality of the arguments in favour of the recommended response should determine attitudes about that response. Perceptions of susceptibility are not believed to be necessary for positive attitudes as for intentions and behaviour. This is because a person can have a positive attitude towards at-risk others adopting the recommended response even when they do not feel personally susceptible to the health risk. For example, a husband may have positive attitudes about his wife engaging in breast self-examination regularly even though he does not feel at risk of breast cancer and thus does not engage in breast self-examination himself. de Hoog et al. (2005, 2007) also suggested that perception of severity would be associated with attitudes. However, the prediction was proposed without clear reasoning being given (see de Hoog et al., 2007, pp. 264-265). It could be argued that individuals may have positive attitudes about a particular recommendation because they believe that it could manage a severe health threat in others.

Several findings suggest that argument quality is associated with a positive attitude towards the recommended response (de Hoog et al., 2005, 2007, 2008 Experiment 2). However, Das et al. (2003) only found this effect in one of three experiments reported in the paper (Experiment 2). de Hoog et al (2008 Experiment 2) found a main effect of severity on attitudes. A meta-analysis of the relevant research also found that severity was associated with attitudes (de Hoog et al., 2007). Most findings in the Stage Model literature also suggest that susceptibility is unrelated to attitudes (de Hoog et al., 2005, 2007, 2008). However, Das et al. (Experiments 1 and 2) found that perceptions of susceptibility were positively related to attitudes. Therefore support for the Stage Model's predictions concerning attitudes is mixed.

Predictions can be made from the Stage Model concerning factors which mediate the relationship between susceptibility and intentions or behaviour. It is predicted that individuals who believe they are susceptible to a health threat following exposure to a fear appeal message will experience negative affect (e.g., fear, guilt, anxiety) and will generate greater numbers of minimising thoughts about the health threat and positive thoughts about the recommendation. Minimising thoughts act as a proxy measure for defensive processing of the threat message – individuals generate thoughts minimising the health threat (e.g., "that won't happen to me because...", "that has been exaggerated") in order to invalidate the threat message and retain their preferred conclusion that they are a healthy individual (de Hoog et al., 2005, 2007, 2008). Positive thoughts about the recommendation (e.g., "I think the diet workshop is a great idea and I would love to participate"; de Hoog et al., 2008, pp. 102) act as a proxy measure of defensive processing of the efficacy message – individuals generate arguments for the recommended response in order to reassure themselves that they can take effective action to alleviate the health threat. It is also predicted that these affective and defensive message processing responses to the fear appeal message will mediate the relationship between perceived susceptibility and intentions (de Hoog et al., 2007). It is further predicted that intentions will mediate the relationship between susceptibility and behaviour (cf. Das et al., 2003; de Hoog et al., 2005, 2008).

In support of these predictions de Hoog et al. (2007) found that perceived susceptibility was positively associated with fear, negative affect, minimising thoughts about the health threat and positive thoughts about the recommendation. Severity was also found to be associated with fear, negative affect and minimising thoughts. Two studies found that the effect of susceptibility on intentions was partially mediated by positive thoughts about the recommendations (de Hoog et al., 2005, 2008, Experiment 2). de Hoog et al. (2008) further found that negative affect partially mediated the relationship. In three separate experiments, Das et al. (2003) found that attitudes and negative affect mediated the effect of susceptibility on intentions. Stage Model studies have also generally found that intentions fully mediates the effect of susceptibility on behaviour (Das et al.; de Hoog et al., 2005, 2007, 2008). These findings suggest that the main effect of susceptibility on intentions are mediated by cognitive and affective responses to the fear appeal message and its effect on behaviour is mediated by intentions. These findings support the predictions of the Stage Model.

Compared to other models reviewed in this paper the Stage Model has received relatively little research interest. So far the Stage Model has stood up well to empirical scrutiny and, on the whole, evidence is consistent with the model's predictions. The Model has been found to explain 25-28% of the variance in attitudes, 22-33% of the variance in intentions and 29-31% of the variance in behaviour (de Hoog et al., 2005, 2008). Although these findings are impressive, a large proportion of the variance remains unexplained by the model.

de Hoog et al. (2007) used their meta-analysis to argue the superiority of the Stage Model over the EPPM (see pp. 272). However, as noted by Maloney et al. (2011) the meta-analysis did not include measures of self-efficacy so any comparisons between the models were based on a reduced version of the EPPM. Further, many of the predictions of the EPPM were simply not tested within the meta-analysis (i.e., main effects of threat and efficacy, interaction effect). The meta-analysis also removed all studies which conflated the manipulation of severity and susceptibility (which includes all of the EPPM research and much of the later PMT-R research). Therefore, de Hoog et al. were essentially comparing their model with a straw man, providing little convincing evidence demonstrating the superiority of the Stage Model. In addition, much of the supporting evidence cited in the meta-analysis was retrospective, using meta-analysis to test the Stage Model predictions using mostly studies not originally designed to test the model. More explicit empirical tests of the Stage Model as a whole are required before it can be established as a useful model for explaining fear appeal outcomes.

An important criticism which may be levelled at the Stage Model is that perceptions of efficacy are given a ‘back-seat role’ in determining health behaviour change. No empirical investigation of the Stage Model has measured perceptions of efficacy as predictors of intentions or behaviour. This is despite the preponderance of research into PMT-R and EPPM suggesting efficacy perceptions (especially self-efficacy) are more important predictors of intentions and behaviour than perceptions of threat (e.g., Milne et al., 2000; Plontikoff, Rhodes et al., 2009; Plotnikoff, Trinh et al, 2009; Ruiter et al., 2003). The Stage Model simply suggests that once a threat has been accepted by an individual they will engage in a biased search for evidence in favour of the effectiveness of the recommended response – a proxy measure of this process is number of positive thoughts about the recommendation. It is implied that this mode of processing will generally lead to high perceptions of efficacy. Therefore, it is also implied that perceptions of threat will determine perceptions of efficacy, as susceptibility is believed to lead to the production of positive thoughts about the recommendation (de Hoog et al., 2005, 2007, 2008). Neither of these implications of the model has been formally tested in the Stage Model literature. Although some evidence from the PMT-R literature suggests positive associations between threat (severity and susceptibility) and efficacy (response- and self-efficacy) variables (e.g., Melamed et al., 1996; Plontikoff, Rhodes et al., 2009; Plotnikoff, Trinh et al., 2009; Van der Velde et al., 1991), other findings suggest no relationship (e.g., Hodgkins et al., 1998; Plotnikoff et al., 1995, 1998, 2002). This suggests that at least the second implication may be questionable. The other implication could be easily tested by investigating whether positive thoughts about the recommendation are related to perceptions of response- and self-efficacy.

It is rather strange that such a test has not emerged in the Stage Model literature especially since it is clearly implied in the description of the cognitive processes which are predicted in the Stage Model. Perhaps like the threat appraisal, the efficacy appraisal will be constrained by evidence and the rules of inference (cf. Kunda, 1987, 1990), and as such only responses which are appraised as effective after some careful (albeit biased) consideration of the evidence may be adopted. de Hoog et al. (2007) in footnote state that the positively biased processing of the efficacy information would be constrained by perceptions of response-efficacy if the recommended response was ridiculous or implausible, and self-efficacy if the recommended response was believed to be too difficult or impossible to adopt. This implies that an, albeit positively biased, appraisal of efficacy, similar to that proposed in PMT-R and the EPPM, whereby perceptions of response- and self-efficacy determine the adoption of the recommended response. Therefore, the Stage Model implies but fails to articulate (and empirically test) a crucial final step in the assumed pathway from a health message to adaptive intentions and behaviour.

If fully realised, the Stage Model could provide an interesting description of the way in which fear appeal information is processed within an EPPM framework. The prediction that perceptions of susceptibility lead to an increase in positive thoughts about the recommendation could be augmented by suggesting that these thoughts in turn influence perceptions of response- and self-efficacy. Then, consistent with the predictions of the EPPM, efficacy perceptions determine intentions and behaviour. This slight modification to the Stage Model could serve to make the predictions of the Stage Model consistent with the much larger PMT-R and EPPM literature.

A related criticism is that there does not appear to be correspondence between the Stage Model's assumptions of how fear appeal outcomes are determined and the explicit predictions of the model. For instance, the model assumes that individuals will engage in defensively biased processing of the threat message in an attempt to invalidate its arguments and as a result minimise their perceptions of personal susceptibility. What is implied here is that if the individual is successful in invalidating the message they will no longer feel susceptible. As a result they will have no motivation to adopt the messages recommendations. However, it is predicted that minimising thoughts about the threat should be positively associated with intentions and will mediate the effect of susceptibility on intentions (e.g., de Hoog et al., 2007). However, in light of the earlier stated prediction, common sense would dictate that this should not be the case because minimising thoughts should serve to reduce perceptions of susceptibility – a key predictor of intentions – and thus may result in message rejection. In support of this view, de Hoog et al. (2008 Experiment 2) found that minimising thoughts about the message did not mediate the relationship between susceptibility and intentions. This suggests that although minimising thoughts were found to have a positive association with intentions, this relationship may have been spurious, confounded by the effect of susceptibility on both variables – i.e., individuals developed maladaptive thoughts because they were susceptible and susceptibility also predicts intentions.

An assumption that can be made from the Stage Model is that an “individual will be unlikely to completely reject the threat if the evidence presented is reasonably persuasive” (Das et al., 2003, pp 651). However, this assumption has not been tested. Stage Model research routinely manipulates the strength of the arguments supporting the recommended response (Das et al.; de Hoog et al., 2005, 2008), however studies have not manipulated the strength of the arguments supporting the health threat. Therefore, it may be the case that when one feels susceptible to a health threat minimising thoughts are an inevitable by-product, but the effect of these minimising thoughts on persuasive outcomes will be moderated by the perceived strength of the evidence supporting the threat. On this view when the evidence is strong, minimising thoughts should have no effect on persuasive outcomes independent of susceptibility, however when the evidence is weak minimising thoughts will be negatively associated with persuasive outcomes.

In sum the Stage Model predicts that, perceptions of threat (i.e., severity and susceptibility), negatively-biased processing of the threat message, and positively-biased processing of the recommended response will in turn mediate the persuasive impact of a fear appeal. Evidence for the model is promising but not conclusive, due to the small number of studies explicitly testing its predictions. As it currently stands the Stage Model appears somewhat incomplete. Some relatively simple changes to its structure and testing could dramatically improve its explanatory power and make it consistent with the extant fear appeal and persuasion research. These changes may include the addition of efficacy perceptions as a determinant of adaptive responses and manipulating arguments supporting both the threat and the recommended response.

Psychographics

A limitation of the EPPM and Stage Model is that they fail to recognise that individuals may have perceptions of personal threat and efficacy independent of and preceding their exposure to a fear appeal message. The revised form of PMT suggests that a number of information sources can determine appraisals of threat and efficacy and their subsequent effect on health behaviour. These include verbal persuasion (e.g., fear appeals, information from friends, family or GP), observational learning (i.e., observing what happens to others), personality variables (e.g., self-esteem [e.g., Rosen, Terry & Leventhal, 1982], trait anxiety [e.g., Dabbs et al., 1966; Janis et al., 1954; Witte & Morrison, 2000]) and prior experience with similar health threats (Rogers, 1983). This notion is also implied in the creation of the Risk Behaviour Diagnosis Scale which is utilised to determine the type of message which should be applied to a given population (Witte et al., 1996). This research suggests that individual's health behaviours may be determined by their psychological characteristics, or what have been termed "psychographics"

Psychographics refers to the individual's psychological characteristics (e.g., beliefs, social norms) as opposed to their demographic characteristics (i.e., age, sex, race etc.). Identification of different psychographic groups has been used by marketers for decades to identify specific groups and tailor advertising and marketing efforts to specific target populations (cf. Weinstein, 1987; Wells, 1975). Slater and Flora (1991) argued that the same principle could be applied to understanding and modifying health behaviour. They conducted cluster analysis on a number of psychological (e.g., attitudes, self-efficacy, susceptibility, health knowledge, family and peer norms) and behavioural (e.g., current exercise, alcohol use, smoking behaviour) characteristics, identifying seven psychographic clusters. It was then investigated how often each cluster engaged in a number of health behaviours over two years (e.g., seatbelt use, increases in exercise). It was identified that those clusters which were characterised by healthy past behaviours (i.e., “healthful adults”, “healthful young adults”, “health talkers” and “youthful athletes”) also tended to have higher perceptions of response- and self-efficacy, lower perceptions of perceived risk and greater health knowledge. The opposite was true for those clusters characterised by unhealthy behaviours (i.e., “unhealthful adults”, “unhealthful young adults”, and “worried older adults”). It was also found that that the “healthful” groups were most likely to adopt healthy behaviours in the future. These findings suggest that the psychological characteristics of individuals may be determinants of their health behaviour independent of an explicit health message being used to prompt action.

Slater et al. (1991) found that the psychographic clusters identified were equivalent to demographic variables in predicting health behaviours. However, it was argued that psychographic data should be more useful in guiding health promotion efforts because it suggests factors which may need to be manipulated in order to increase the uptake of healthy behaviour within a given psychographic group. For example, it was identified that the cluster “worried older adults” lacked knowledge and self-efficacy with respect to behaviours which may reduce their cardiovascular disease risk. Therefore interventions aimed at raising relevant knowledge and skills may be effective for this group. The Risk Perception Attitude Framework (RPA; Rimal, 2001, Rimal et al., 2003) sought to develop this line of reasoning and utilised the EPPM as a basis for developing predictions concerning particular psychographic groups.

Risk Perception Attitude Framework

The RPA predicts that existing perceptions of threat and efficacy may be used to identify four distinct psychographic groups which will differ in how they respond to a health issue. The predictions of the RPA closely correspond to those of the EPPM (Rimal, 2001; Rimal et al., 2003; Maloney et al., 2011). According to the model those with high perceived threat and efficacy concerning a particular health issue and their ability to cope with it hold a *responsive attitude.* It is predicted that responsive individuals will be the most likely to spontaneously adopt health protective behaviour (Rimal et al., 2003). Those who have high perceived threat but low efficacy hold an *avoidance attitude.* Avoidant individuals are concerned about their health status but their motivation to adopt protective behaviour is constrained by their low perceived efficacy – they do not believe they will be able to adope appropriate effective action so are unwilling to try. Those who have low perceptions of threat but high efficacy hold a *proactive attitude*. Even though these individuals do not feel susceptible they may engage in protective behaviour in order to remain risk free. They may also hold a proactive attitude precisely because they are already engaging in protective behaviour. For example, an individual may not feel at risk of cardiovascular disease because they have a healthy lifestyle – but are motivated to maintain that healthy lifestyle in order to prevent cardiovascular disease or other health problems. Finally those who have low perceptions of both threat and efficacy hold an *indifference attitude*. Indifferent individuals should be least likely to spontaneously adopt a behaviour change as they do not believe they are at risk and do not believe they could adopt protective action even if they were. Therefore, from their point of view there is no reason to adopt health protective responses.

The RPA constitutes a common sense application of the principles of the EPPM to predicting health behaviour outside of a fear appeal context. It can be seen as an attempt to predict health behaviours in naturalistic settings. Several of the predictions are similar (if not identical) to those of the EPPM (Maloney et al., 2011). The model predicts that adaptive responses are most likely for responsive individuals followed in turn by proactive, avoidant and indifferent. Similar to the EPPM, a threat by efficacy interaction is posited such that efficacy perceptions moderate the effect of high risk on adaptive outcomes. However, in RPA research threat is replaced by perceived risk (susceptibility) and efficacy by self-efficacy alone.

In contrast to the EPPM, the RPA also investigates health knowledge as dependant variables (Rimal, 2001; Rimal, Brown et al., 2009; Rimal et al., 2003; Turner, Rimal, Morrison & Kim, 2006). Health knowledge alone has been found to have weak to moderate associations with adaptive health intentions and behaviour (e.g., Rimal, Böse, Brown, Mkandawire & Folda, 2009; Rimal & Flora, 1998; Rimal & Juon, 2010), but it may interact with other factors (e.g., social influences, self-efficacy, structural barriers to the adoption of behaviour) to motivate the uptake of protective responses (cf. Hornik, 1989; Rimal, 2000). The RPA's predictions concerning health knowledge closely mirror those for health behaviour. Responsive individuals should actively seek health information and as a result have high levels of health knowledge. Avoidant individuals are conflicted, they feel susceptible and are motivated to reduce that risk, but their information seeking behaviour may be constrained by their low perceptions of efficacy. As a result, health information may be avoided as it highlights their risk status (cf. Brashers, Goldsmith & Hsieh, 2002) thus their health knowledge will be reduced relative to responsive individuals. Proactive individuals may seek information to inform their health behaviour and remain risk free resulting in greater health knowledge; they may also believe they are risk free precisely because they have a high degree of health knowledge which they are drawing upon in order to make healthy lifestyle choices. Indifferent individuals are unlikely to seek information as they are not motivated by a perceived risk and feel that they are unable to adopt protective action. Therefore, similar to behaviour change a risk by efficacy interaction effect is predicted for information seeking and health knowledge.

Studies investigating the predictions of the RPA regarding intentions and behaviour have found mixed support. Some research has shown that groups with high efficacy (proactive and responsive) were more likely to have adaptive intentions or behaviour than groups with low efficacy (avoidant or indifferent) groups (Rimal, Brown et al., 2009; Rimal et al., 2003, Experiment 1), with essentially no effect of risk group. This is supported by research which suggests that only perception of efficacy are important in determining intentions and behaviour (e.g., Hodgkins et al., 1998; Lippke et al., 2009; Plotnikoff et al. 1995; Plotnikoff, Rhodes et al., 2009; Plotnikoff, Trinh et al., 2009; Rimal, Böse et al., 2009; Rimal & Jose, 2010; Ruiter et al., 2003; Wallace, 2002). Other research has found that the indifference group has the least intention to adopt health behaviour but the other three groups are not differentiated (Rimal et al., 2003, Experiment 2); still others find that the responsive group shows the greatest intention – clearly differentiated from the remaining three psychographic groups (Turner et al., 2006, Experiments 1 and 2). The only consistent finding is that the indifferent group is the least likely to display adaptive responses. Although this research is somewhat supportive of the RPA's predictions, no studies have found the predicted group ranking (i.e., responsive, proactive, avoidant, indifferent; cf. Turner et al., 2006) despite very large sample sizes in many studies (N >850, Rimal, 2001; Rimal, Böse et al., 2009; Rimal, Brown et al., 2009). These findings suggest that assignment to groups on the basis of both risk and efficacy perceptions may be of limited use for predicting the adoption of protective behaviour.

The findings regarding health knowledge have also been mixed. Some findings report that groups with higher efficacy perceptions had greater health knowledge than those with low efficacy perceptions regardless of threat (Rimal, 2001; Rimal, Brown et al., 2009). However, Rimal et al., (2003 Experiment 1) found no differences between any of the groups. Turner et al. (2006 Experiment 2) found that although avoidant individuals are just as likely as other groups to seek information about a health issue; when given the opportunity, they were less likely to gain knowledge as a result. It was argued that this was the result of heightened anxiety interfering with information processing and recall (cf. Miller, Mueller, Goldstein & Potter, 1978). However, individuals in the responsive group also had high anxiety but their knowledge was greater than those in the avoidant group. It was revealed that for individuals in the avoidant group the relationship between information seeking and health knowledge was moderated by anxiety such that greater anxiety resulted in a less strong relationship between information seeking and health knowledge. This pattern of results was not found for the remaining three groups. This suggests that avoidant individuals may fail to benefit from health information in the same way as other respondents, especially when that health information provokes anxiety.

The RPA has not been extensively tested, but may be a useful model for guiding health promotion campaigns based on the psychographic characteristics of the target population. Rimal, Brown et al. (2009) suggested that interventions targeted at avoidant individuals should focus on skills development and enhancing self-efficacy; whereas those with an indifferent attitude may benefit from messages highlighting both threat and efficacy. To date, these predictions have not been explicitly tested. However, examining how individuals with different psychographic characteristics respond to fear appeal messages is an interesting venture for research.

The predictions of the RPA extend upon the predictions of the EPPM by highlighting that individuals with different psychographic characteristics should differ in their uptake of adaptive behaviours on the basis of their threat and efficacy perceptions. However, it is not clear whether the four groups identified differ in their responding as the model predicts. Several findings have reported no significant differences between two or more of the groups on all or most outcome measures (e.g., Rimal, Brown et al., 2009; Rimal et al., 2003 Experiment 1; Turner et al., 2006). This is not necessarily problematic as the variables used to develop the clusters can inform why a particular group does or does not engage in protective behaviour. This in turn may inform the development of tailored health messages for particular at risk groups. How the psychological characteristics of respondents determine how they respond to fear appeal messages is a research area which demands greater attention.

Summary of Fear Appeal Research

The majority of extant fear appeal research to date has focused on three key constructs: fear, perceived threat and perceived efficacy. Earlier models such as the fear-as-acquired-drive model (Hovland et al., 1953) and the family of curves model (Janis, 1967) focused on fear and its reduction as the key determinants of behaviour change. It was argued that if a response leads to reduction of fear it will be reinforced and as a result more likely to be adopted and maintained. However, when converging evidence amassed that fear reduction was often not associated with behaviour change the literature changed focus. Leventhal’s (1970, 1971) parallel response model suggested that individuals may be motivated for change by both the desire to alleviate an imminent health threat (danger control) and to reduce their fear associated with that threat (fear control). Roger's (1975, 1983) elaborated Leventhal's danger control processes with his PMT and PMT-R arguing that individual's perceptions of threat and appraisals of their coping resources will determine adaptive outcomes. However, the model failed to account for fear control processes (Witte, 1992). Witte's EPPM sought to extend PMT-R by explaining both danger control and fear control processes. This generated several new predictions, but the evidence for these new predictions has been somewhat mixed. Both the Stage Model (Das et al., 2003; de Hoog et al., 2005, 2007, 2008) and the RPA (Rimal, 2001; Rimal et al., 2003) sought to extend the EPPM. The Stage Model attempted to describe how information in fear appeals is processed and how the manner of processing determines outcomes. The RPA sought to apply the predictions of the EPPM to naturalistic settings, investigating whether individuals existing perceptions of threat and efficacy may determine their health behaviours. Therefore, there has been considerable conceptual and methodological innovation in fear appeal research over the past 60 years.

However, despite the intuitive appeal of models such as the EPPM and PMT-R findings within the literature are still somewhat inconsistent (cf. Ruiter et al., 2001; Witte & Allen, 2000). Estimates of the variance in intentions and behaviour explained by current models range from around 20 to 55%. This is a rather large margin of error and suggesting significant heterogeneity in findings (cf. de Hoog et al., 2007; Milne et al., 2000; Witte & Allen, 2000). Further, in most cases the majority of the variance remains unexplained by any single model. This suggests that current fear appeal models are incomplete and may benefit from reformulation or the addition of theoretically relevant constructs. This may be achieved by looking to other models which have been applied to predicting health behaviour and incorporating features of those models into current fear appeal models. Perhaps the most popular model applied to the prediction of health behaviour is Ajzen's (1985, 1987, 1991) Theory of Planned Behaviour and its precursor the Theory of Reasoned Action (Fishbein & Ajzen, 1975).

The Reasoned Action Approach to the Prediction of Health Behaviour

Theory of Reasoned Action

Although the theories of reasoned action (TRA; Fishbein & Ajzen, 1975) and planned behaviour (Ajzen, 1985, 1987, 1991) were not developed specifically as theories of health behaviour, both have been applied extensively to the prediction of health behaviours (Godin & Kok, 1996; McEachan et al., 2011). Similar to PMT-R, the TRA posits that the proximal determinant of behaviour is one's intention to adopt that behaviour. Intention refers to the strength of the motivation or desire to engage in a particular behaviour. The stronger the intention the more likely the behaviour will be enacted (Ajzen, 1991).

According to the TRA, intentions are determined by attitudes and subjective norms. Both of which are determined by specific beliefs relevant to the behaviour. One's attitude towards a behaviour refers to their appraisal of their engaging in the behaviour. This appraisal may be either positive or negative. Beliefs contributing to the formation of an attitude include the expected outcomes of engaging in the behaviour (behavioural beliefs) and whether or not these outcomes are appraised as favourable or unfavourable (subjective evaluation). Behavioural beliefs and subjective evaluation are believed to combine multiplicatively such that more positive attitudes are generated when expected outcomes are appraised as favourable. Subjective norms refer to the "perceived social pressure to perform or not perform the behaviour" (Ajzen, 1991, pp. 188). The beliefs which determine subjective norms are the perceived likelihood that important people in the individual's life (e.g., friends, family members, medical professionals) will approve or disapprove of them engaging in a particular behaviour, and their motivation to comply with each important other's wishes. If a person believes that important others approve of their performing the behaviour they are more likely to intend to do so, so long as they are motivated to comply with these individuals' wishes. Therefore the TRA predicts that behavioural intentions are the proximal predictor of behaviour and intentions are determined by positive attitudes about the behaviour and the perceived social pressure to perform the behaviour.

The TRA was believed to be capable of explaining any behaviour, so long as it was under the volitional control of the individual and all measures correspond to the behaviour in terms of the action required, the timeframe over which the behaviour should be performed and the level of specificity of the behaviour (e.g., Fishbein et al., 1975; Ajzen & Fishbein, 1977, 1980). Therefore, if the target behaviour is engaging in rigorous exercise 30 minutes per day, 5 days per week, then in order to optimise prediction items pertaining to intentions, attitudes and subjective norms also need to refer to that specific behaviour, not something more general (i.e., "I intend to exercise"; Ajzen, 1991; Ajzen et al., 1977). Findings suggest that lack of correspondence between behaviour and its predictors lead to poorer prediction of behaviour (e.g., Ajzen & Timko, 1986; see Ajzen et al., 1977 for a review). It is also believed that intention will be a more robust predictor of behaviour when it is measured shortly before the behaviour is enacted. This is because over time events may occur to change individual's attitudes, subjective norms and intentions concerning the behaviour of interest reducing their predictive validity (Ajzen, 2011). Research and meta-analyses have shown that temporal stability of intentions over time, and time between the measurement of intentions and behaviour each moderate the strength of the relationship between intentions and subsequent behaviour (e.g., Conner, Sheeran, Norman & Armitage, 2000;

Cooke & Sheeran, 2004; McEachan et al., 2011; Sheeran, Orbell & Trafimow, 1999). As such, the TRA is posited to be an effective model in predicting behaviour, but only under certain circumstances. The behaviour must be volitional, the measurement of behaviour and its predictors must correspond with one another and intentions, attitudes and subjective norms must remain stable during the time between measurement of the predictors and the enactment of the behaviour (e.g., Fishbein et al., 1975; Ajzen & Madden, 1986).

Sheppard, Hartwick and Warshaw (1988) conducted a meta-analysis of TRA research generally finding support for its conclusions over a wide range of behaviours (both health-related and not). The TRA was found to explain approximately 28% of the variance in behaviour and 44% of the variance in intentions. However, it was noted that there was significant heterogeneity in the findings. For intentions, correlations for the effect of attitudes and subjective norms on intentions ranged from .24 to .92; correlations between intentions and behaviour ranged from .10 to .94. This indicated that for some behaviours the TRA offered very good predictions, but for others the TRA was inadequate. This disparity in the extant findings suggested an unmeasured variable may be moderating the effect of attitudes and subjective norms on intentions, and intentions on behaviour. Sheppard et al. argued that many studies applied the TRA to research questions which were outside of the constraints of the model outlined above. For example, research attempted to explain behaviours which were not under complete volitional control (e.g., have a child in the next two years, Davidson & Jaccard, 1979; eat only non-fattening food, converse with an attractive stranger, Warshaw & Davis, 1985) using the TRA. Sheppard et al. showed that the prediction of intentions and behaviour was stronger when behaviour was under volitional control than when it was not. Clearly then the prediction of volitional behaviours was a limitation of the TRA, this limitation was addressed with the development of the Theory of Planned Behaviour (TPB).

Theory of Planned Behaviour

Ajzen (1985, 1987; Ajzen et al., 1986) argued that several behaviours are at least to some degree determined by factors outside our control. Behaviours such as maintaining an exercise program are constrained by factors which are largely outside the individual’s control (e.g., time, money, inclement weather, opening hours of the gym, personal illness/injury). These factors may make maintaining a regular exercise program more difficult. Even relatively simple behaviours like arriving at work on time may be impeded by factors outside of an individual’s control such as mechanical failure within the car or unexpected heavy traffic. Under these circumstances the relationship between one’s intention and their behaviour will be constrained by factors outside of their control. When this occurs personal intentions alone are unlikely to accurately predict behaviour. Therefore enactment of behaviour is at least in part determined by one’s actual control over performing that behaviour.

Unfortunately accurate measurement of all the factors which could possibly constrain (or facilitate) engaging in a particular behaviour is infeasible, if not impossible (Ajzen & Madden, 1986). However, it was argued that we can measure one’s perceptions of their control over their behaviour. The TPB (Ajzen, 1985, 1987, 1991) maintained the structure of the TRA but added an additional construct that was posited to impact on both intentions and behaviour – perceived behavioural control (PBC). Perceived behavioural control is conceptually similar to Bandura’s (1977, 1982, 1991) concept of self-efficacy and refers to the individual’s appraisal of how easy or difficult engaging in the behaviour will be (Ajzen, 1991). In determining their PBC individuals consider the relevant resources (i.e., requisite skills, social support, disposable income etc.) they have available to them which will assist in performing the behaviour, and any barriers or obstacles they may need to overcome in order to effectively adopt the behaviour. These are collectively referred to as control beliefs. The extent to which each control belief inhibits or facilitates performance of the behaviour is also considered (perceived power). Similar to behavioural and normative beliefs, control beliefs combine multiplicatively with perceived power to determine PBC.

Perceived behavioural control is believed to have a direct impact on both behaviour and intentions. It is argued that if people believe that they will be successful in performing the behaviour they will be more likely to expend greater effort in adopting it (Ajzen, 1991). This increased effort should therefore increase the probability that individual’s intentions will translate into behaviour. Further it is argued that PBC can be utilised as an imperfect proxy measure of actual control (Ajzen, 1991). Individuals are at least to some extent aware of the facilitating and inhibiting factors which will influence the successful performance of the behaviour; and behaviours will be more likely to be adopted if there are a greater number of facilitating factors and fewer inhibiting factors. As such, when behaviours are not under complete volitional control, perceptions of control should contribute to the prediction of behaviour independent of the effect of intentions. The effect of PBC on behaviour will of course be constrained by the accuracy of the individual’s perceptions of control (Ajzen, 1991, 2002b). When perceptions are inaccurate PBC may add little to the prediction of behaviour. It is argued that for simple behaviours which are mostly under the volitional control of the actor, PBC will not be an important predictor of behaviour. The actor should simply act on their intentions as they are unfettered by barriers or obstacles which may constrain performance. However, as behavioural performance becomes more difficult or effortful, PBC will become an increasingly important predictor of behaviour.

Perceived behavioural control is also believed to exert an effect on intentions. The rationale for this is simple; why would you intend to engage in a behaviour when you believe that you will definitely not be successful in performing that behaviour? For example, an individual may believe that competing in the Tour de France would be associated with several beneficial outcomes and believe that their friends and family would approve of the decision, however, if they will not intend to do so if they do not have the requisite physical fitness, money or time to do so. When behaviours are not under complete volitional control perceptions of PBC should predict intentions independent of the effects of attitude and subjective norms.

In summary, the TPB predicts that the proximal determinants of behaviour will be intentions to perform that behaviour and perceptions of control over that behaviour. Individuals are most likely to intend to adopt a behaviour if they believe that the outcomes of the behaviour will be favourable (attitudes), believe significant others will approve (subjective norms) and believe that they will be successful in overcoming any barriers to adopting the behaviour. The extent to which PBC exerts a direct influence on behaviour and intentions should be determined by how much the behaviour investigated is under volitional control. The relative impact of each of the predictors of intentions may also differ depending on the behaviour under investigation (Ajzen, 1991).

Evidence supporting the TPB.

The TPB has received much research interest especially in more recent years. Ajzen (2011) found that the number of citations has increased exponentially between the year of its conception (Ajzen, 1985) when there were 22 citations, to 2010 when there were

4550 citations. Further, from 2011 to present (June 2014) there have been a further 700+ citations of the TPB. The TPB has been found to be useful in explaining a variety of health behaviours (e.g., Armitage & Conner, 2001; Godin & Kok, 1996; Hagger, Chatzisarantis & Biddle, 2002b; McEachan et al., 2011; Notani, 1998; Rivis & Sheeran, 2003; Sandberg & Conner, 2008; Sheeran, Abraham & Orbell, 1999; Sheppard et al., 1988). Meta-analytic reviews suggest that the TPB explains on average 30-51% of the variance in behavioural intentions and 14-34% of the variance in health behaviour (Godin et al.; Hagger et al.; Hausenblas, Carron & Mack, 1997; McEachan et al.; Sandberg et al.; Sheeran, Abraham et al., 1999; Sheeran & Taylor, 1999). However, these estimates are moderated by the type of health behaviour being analysed (McEachan et al.). The TPB was better able to predict diet and exercise behaviours than other health behaviours (e.g., safe sex, abstaining from drugs/alcohol, risk taking behaviours); it was also better able to explain diet, exercise and safe sex intentions. Reviews of the literature consistently suggest that the TPB explains a greater proportion of the variance in intentions and behaviour than the TRA (e.g., Hausenblas et al.; McEachan et al.; Sheeran & Taylor, 1999). However, although the TPB explains a large proportion of the variance in intentions and behaviour, it appears to be insufficient, as a large proportion of the variance remains unexplained; suggesting other variables may be able to be added to the model to increase its explanatory power.

The sufficiency assumption. Many researchers have questioned Ajzen’s (1991) assumption that the factors of the TPB are sufficient for predicting intentions and behaviour (e.g., Chatzisarantis, Hagger, Smith & Sage, 2006; Conner & Armitage, 1998; Eagly & Chaiken, 1993; Hagger et al., 2002a, 2002b; McEachan et al., 2011; Rivis & Sheeran, 2003; Sandberg et al., 2008). An implication of this assumption is that no other variable should contribute unique variance to the prediction of intentions or behaviour after controlling for the TPB variables (Ajzen, 2011). Most researchers agree that the components of the TPB are each useful in the prediction of intentions and behaviour, but many have investigated whether other factors may be incorporated into the model to increase its predictive and explanatory power. A number of factors have been shown to increase the predictive power of the TPB or moderate outcomes (see Ajzen, 2011 and Conner et al., 1998 for a review), these include: moral norms (e.g., Beck & Ajzen, 1991; Conner et al., 1998), self-determined motivation (e.g., Hagger & Chatzisarantis, 2008, 2009), mindfulness capacity (Chatzisarantis & Hagger, 2007), anticipated regret (e.g., van der Pligt & de Vries, 1998; Sandberg & Conner, 2008) and self-identity (e.g., Sparks, Shepherd, Wieringa & Zimermans, 1995). However, three variables which have been investigated extensively as additions to the TPB are self-efficacy, descriptive norms and past behaviour/habit.

Contrasting perceived self-efficacy and perceived controllability. Although researchers have suggested a conceptual similarity between PBC and self-efficacy (cf. Ajzen, 1985, 1991; Ajzen & Madden, 1985), a large body of evidence suggests that measures of PBC are often conflated measuring two distinct constructs: perceived self-efficacy – beliefs about how easy or difficult the behaviour will be to adopt; and perceived controllability – whether success in adopting the behaviour is under the volitional control of the actor (e.g., Ajzen, 2002; Armitage & Conner, 1999a, 1999b; Conner & Armitage, 1998; Terry & O'Leary, 1995; Trafimow, Sheeran, Conner & Finlay, 2002). Principal components analyses have been utilised to support the distinction between perceived self-efficacy and perceived controllability (e.g., Terry et al.; Armitage et al., 1999a, 1999b). The results of studies which have measured both factors have been mixed. Some research has found that each of the factors contributes unique variance to the prediction of intentions and behaviour (e.g., Garcia & Mann, 2003 Study 1; Hagger et al., 2002; Povey, Conner, Sparks, James & Shepherd, 2000a; Terry et al.). Other research suggests that only perceptions of self-efficacy are important (e.g., Armitage et al., 1999a, 1999b; Garcia et al., Study 2; Manstead & van Eekelen, 1998; Rhodes & Coureya, 2003; White, Terry & Hogg, 1994). This suggests that perceptions of controllability and self-efficacy are distinct constructs and may be complimentary in explaining behavioural intentions and behaviour within the TPB. However, the self-efficacy component may be a more reliable predictor than perceived controllability. Thus, examining these factors as separate independent predictors of intentions is warranted.

Descriptive norms. Several researchers have noted that subjective norms are often a weaker predictor of intentions than either attitudes or PBC as evidenced by effect sizes in meta-analytic reviews and regression weights (e.g., Ajzen, 1991; Armitage et al., 2001; Conner & Armitage, 1998; Rivis et al., 2003). For example Ajzen (1991) found that of nineteen studies investigating the predictors of intention, only nine found a unique effect of subjective norms after controlling for attitudes and PBC. Researchers have suggested that it is due to the normative component within the TPB being too narrowly defined (e.g., Armitage et al.; Cialdini, Reno & Kallgren, 1990; Fishbein, 2000; Rivis et al.). These researchers have argued for extending this component of the TPB by incorporating both injunctive (what significant others think a person ought to do) and descriptive normative influences (what the individual has observed others doing) into the model (e.g., Rivis et al.; Sheeran & Orbell, 1999). Injunctive norms are more closely aligned with the conception of subjective norms within the TPB (Rivis et al.; Sheeran et al.). Researchers have argued that observing others behaviour exerts an influence on behaviour as individuals make the assumption that what others do in a particular situation is the correct or sensible thing to do

(Cialdini et al.; Fishbein & Ajzen, 2010). In support of this theory, Cialdini et al. showed that when people are led to believe that littering is the norm in a particular situation (i.e., litter filled car park, observing individual littering) they are more likely to litter themselves. Further, the stronger the normative pressure (i.e., more pieces of litter) the greater the tendency to litter. These findings suggest that individuals are likely to do what they perceive others to be doing; even for a morally questionable behaviour such as littering.

Research utilising factor analyses have shown support for the convergent and discriminant validity of the descriptive and injunctive norms constructs (Grube, Morgan & McGree, 1986; Sheeren et al., 1999). Further, descriptive norms have been shown to enhance the prediction of intentions after controlling for the effect of attitudes, injunctive norms and PBC (Conner & McMillan, 1999; McMillan & Conner, 2003a, 2003b; Rivis et al., 2003; Sheeren et al.; White et al., 1994). However, other findings have found that descriptive norms do not add to the prediction of intentions after controlling for the other TPB variables (Povey, Conner, Sparks, James & Shepherd, 2000b). The findings of a meta-analytic review suggested that the strength of the association between descriptive norms and intentions is moderated by age (stronger association for younger samples) and type of health behaviour (stronger association for behaviours which increase health risk [e.g., smoking, alcohol misuse], than for those which promote health [e.g., exercise, healthy diet]; Rivis et al.). The converging evidence led Fishbein (2000) to propose an extension of the TPB which included extending the normative component to incorporate descriptive norms (see also Fishbein & Ajzen, 2010).

Past behaviour/habit strength. Ajzen (1991, 2011) argues that a measure of past behaviour may be used to test the sufficiency assumption of the TPB when the behaviour and its determinants are stable over time. Under such conditions past behaviour should be a strong predictor of future behaviour. If the TPB is sufficient, prior behaviour should not add significant unique variance to the model. However, meta-analytic reviews of the TPB consistently suggest that past health behaviour is a relatively strong and consistent predictor of both future intentions and behaviour even after controlling for the effects of attitudes, subjective norms, PBC and intentions (e.g., Conner et al., 1998; Hagger et al., 2002b, Hagger et al., 2009; McEachan et al., 2011; Sandberg et al., 2008). The addition of past behaviour to the model also significantly attenuates the effects of intentions and PBC on behaviour, and the effects of attitudes, subjective norms and PBC on intentions (McEachan et al.). This suggests that the effect size estimates for TPB factors on intentions and behaviour may be spuriously high, masking the effect of past behaviour on future behaviour.

Despite these findings, Ajzen (2011) argued that past behaviour should not be added to the TPB as there is no mechanism by which past behaviour directly causes future behaviour. Saying that past behaviour causes future behaviour is as nonsensical and unsatisfying as saying that the sun will rise tomorrow because the sun rose yesterday. The prediction made is correct but we gain no understanding of the causal mechanisms underlying the phenomenon of interest. What the past behaviour-future behaviour connection is essentially saying is that an individual engages in behaviour X because they are the sort of person who engages in behaviour X, which is of course begging the question (Fishbein et al., 2010). Further, the past behaviour-future behaviour link is not particularly useful from a health promotion standpoint. An important reason why the link between psychosocial factors and health behaviour is important is that these factors are, at least in theory, subject to manipulation through health promotion efforts. Theoretically, if we are able to effectively manipulate behavioural, normative and control beliefs in an individual these changes should ultimately lead to changes in intention and behaviour (cf. Ajzen, 1991). This is not the case for past behaviour; it cannot be changed any more than an individual’s sex, age or race. As past behaviour cannot cause future behaviour there must be some underlying psychological mechanisms mediating this effect.

Ouellette and Wood (1998) argued that when behaviours are performed frequently within similar contexts the performance of that behaviour can become automatic or habitual – occurring independent of the conscious deliberation posited by the TPB (cf. Maddux, 1993; Ronis, Yates & Kirscht, 1989). An example of this type of habitual response may be brushing one’s teeth before bed each night. Over time and repeated performance of this behaviour becomes automatic in response to specific situational cues. In such cases the correspondence between past behaviour and future behaviour should be very strong. In contrast, it was argued that when behaviours are performed relatively infrequently or need to be performed in an unfamiliar context conscious deliberation and the formation of an intention should mediate the decision to engage in a particular behaviour. In these cases the link between past behaviour and future behaviour should be relatively weak or non-significant. Frequency of past behaviour is often conceptualised as habit or habit strength within the literature (Conner et al., 1998; Ouellette et al.).

Ouellette et al. (1998) conducted a meta-analysis of the relationship between past behaviour/habit and each of the TPB variables. As predicted, when the target behaviour was performed daily or weekly the relationship between past behaviour and future behaviour was strong (r = .59), however when the target behaviour was performed more infrequently (i.e., biannually or yearly) the relationship was weak but still remained significant (r = .27). Past behaviour was also found to impact on intentions, attitudes, subjective norms and perceived behavioural control. Although the size of the effect differs as a function of the behaviour under investigation (McEachan et al.) and the frequency with which the behaviour is performed (Ouellette et al.), past behaviour is a reliable predictor of both intentions and behaviour within the TPB framework.

Fishbein et al. (2010) offered two explanations for why past behaviour may account for unique variance in future behaviour after controlling for the effects of the TPB constructs. Firstly, there is often a problem of scale compatibility between measures of behaviour and measures of intention. Intentions are usually measured on a Likert scale with items asking the likelihood that an individual will engage in a particular behaviour. Behavioural measures usually ask respondents to report how often they have engaged in the behaviour, or may even employ objective measures such as pedometers for exercise or food diaries at both time points. Therefore, the methods used to measure past behaviour and future behaviour are identical, but they differ from the measurement of intentions. This difference introduces measurement error which may account for a reduction in the explained variance attributable to intentions. In support of this view, Ajzen (1991) argued that across three studies past behaviour only contributed 2.1% of the variance in behaviour after controlling for PBC and intentions. It was argued that this small effect may be attributable to similar measurement procedures between past and future behaviour alone. However, Conner et al. (1998) reviewed eleven later studies finding that past behaviour contributed an additional 7.2% of the variance in the prediction of intentions and an additional 13.0% of the variance in behaviour after controlling for TPB constructs. McEachan et al. (2011) found similar results: the addition of past behaviour to the TPB explained between 3.4 and 25.3% of additional variance in behaviour and between 1.6 and 8.2% of additional variance in behavioural intentions. These effects are likely to be too large to be attributable to common method variance alone.

Secondly, it was argued that individual's intentions may not be stable over time resulting in a reduction in its ability to predict behaviour (cf. Ajzen, 2002b). For instance, an individual may initially intend to adopt a healthy diet but upon adopting this diet they find it difficult to maintain, due to cravings for unhealthy foods and difficulties obtaining and preparing healthy food. These experiences will naturally impact on their attitudes, subjective norms and PBC resulting in a change in intention. If this change in intention goes unmeasured, the individual's initial intention may be a poor predictor of their future behaviour, resulting in a strong past behaviour-future behaviour association. A problem with this explanation is that it could be used to make the TPB unfalsifiable. That is if the TPB performs poorly in a study the researchers may simply attribute this to the participants intentions being unstable over time, effectively protecting the model from negative results.

Ajzen (2002b) offered a third explanation for the past behaviour-future behaviour link. It was argued that the determinants of the behaviour in the past are likely to impact on the behaviour in the future. Therefore, if any such determinants were unmeasured in a particular study the past behaviour-future behaviour link may be attributable to the effect that this unmeasured variable(s) exert on both past and future behaviour. As such, Ajzen suggests that the link may be spurious, mediated by an unmeasured variable. Ajzen offers a number of potential candidates for mediator variables "including personal or moral norms (e.g., Gorsuch & Ortberg, 1983), anticipated regret (e.g., Richard, van der Pligt, & de Vries, 1995), desire to attain a behavioral goal (Perugini & Bagozzi, 2001), self-identity (e.g., Sparks & Guthrie, 1998), and affect (Manstead & Parker, 1995)" (pp. 110). However, no positive evidence of a mediated relationship between past and future behaviour was provided. Although this explanation is plausible and may generate new predictions, it essentially suggests that the current conceptualisation of the TPB is still an insufficient explanation of behaviour; just for a different reason.

The findings detailed above appear to violate the sufficiency assumption of the TPB, at least with respect to health behaviours. Among other predictors, self-efficacy, descriptive norms and past behaviour/habit have each been shown to explain unique variance in intentions and behaviour. However, even after adding these variables to the TPB there is still unexplained variance in intentions and behaviour (e.g., Hagger et al., 2002, Hagger et al., 2009; McEachan et al., 2011; Rivis et al., 2003; Sheeran et al., 1999). As such there may be other constructs which should be considered and investigated which may increase the explanatory power of the TPB. Fortunately there is a prolific and diverse literature on the prediction of health behaviour which may be drawn upon in order to guide the selection of variables to be added to the TPB.

Model Comparison and Theoretical Integration

The Fragmented State of the Health Behaviour Literature

The proliferation of health behaviour theories (HBTs) has led to the development of a very diverse array of theoretical models applied to the prediction and explanation of health behaviour. Several such models have been included in the review above however a full list could fill several pages. Michie et al., (2005) identified 33 health behaviour models with 128 theoretical constructs. Some notable examples include: the Health Belief Model (Becker, 1974; Becker, Drachman, Kirscht, 1974; Rosenstock, 1966); Theory of Reasoned Action (Fishbein et al., 1975); Theory of Planned Behaviour (Ajzen, 1985, 1987, 1991); Social Cognitive Theory (Bandura, 1977a, 1986, 1998); the

Fear-as-acquired-drive Model (Hovland, et al., 1953); family of curves (Janis, 1967); Nonmonotonic model (McGuire, 1968); Parallel Response Model (Leventhal, 1970, 1971); Protection Motivation Theory (Rogers, 1975, 1983); Extended Parallel Process Model (Witte,1992a); Stage Model (Das, de Wit & Stroebe, 2003; de Hoog Stroebe & de Wit, 2005, 2007, 2008); Transtheoretical Model (Prochaska & DiClemente, 1983; Prochaska, DiClemente & Norcross, 1992); Risk Perception Attitude Framework (Rimal, 2001; Rimal & Real, 2003); Habit Theory (Maddux, 1993; Ronis et al., 1989) Terror Management Theory (e.g., Greenberg, Pyszczynski & Solomon, 1986; Jessop & Wade, 2008); Self-determination Theory (e.g., Deci & Ryan, 2000; Ryan & Deci, 2000); Elaboration Likelihood Model (Petty & Cacioppo, 1986); Heuristic-Systematic Model (Chaiken, Liberman & Eagly, 1989; Liberman & Chaiken, 1992) and the Health Action Process Approach (Schwarzer, 1992). Each of these models has been applied, with at least some degree of success, to predicting health behaviour. This large selection of models means that we have a diverse and vibrant literature to draw upon when making judgements concerning the prediction of health behaviour. It may be argued that this is a desirable state of affairs for a discipline still in its infancy. Numerous theories mean that numerous perspectives on the problem of predicting behaviour are considered and investigated. However, this diverse literature also presents researchers and health practitioners with a problem: how do we decide which model to utilise in order to predict or explain health behaviour?

The Case for Model Comparison

The health behaviour literature has been very prolific in advancing HBTs and testing these theories. However, despite the large amount of research into HBTs there is still no consensus on which model is most useful, accurate and precise (Johnston & Dixon, 2008; Maddux, 1993; Noar & Zimmerman, 2005). A reason for this is that there are few studies comparing these HBTs for their effectiveness in explaining health behaviour (Garcia & Mann, 2003; Noar et al.; Weinstein, 1993). It has been argued that this state of affairs impedes the natural evolution of HBT, meaning that our knowledge about health behaviour fails to naturally develop (cf. Johnson et al.; Noar et al., 2005; Ogden, 2003; Painter, Borba, Hynes, Mays & Glanz, 2008; Weinstein, 1993, 2007; Weinstein & Rothman, 2005). Most often one HBT is arbitarilly selected to guide the choice of explanatory and outcome variables as if the other theories did not exist (Hardeman et al., 2002; Weinstein, 1993).

Each HBT has a “mini-literature” (Noar et al., 2005) associated with it which often strongly supports the model’s predictions. For example, qualitative and meta-analytic reviews provide support for the Theory of Reasoned Action/Theory of Planned Behaviour (e.g., Ajzen, 1991, 2011; Ajzen & Fishbein, 1980; Armitage et al., 2001; Cooke & French, 2008; Godin et al., 1996; Hagger et al., 2002; McEachan et al., 2012; Shepherd et al., 1988); Social Cognitive Theory (i.e., Bandura, 1986, 1998); Health Belief Model (Harrison, 1992); Protection Motivation Theory (i.e., Floyd et al., 2000; Milne et al., 2000); the Extended Parallel Process Model (i.e., Witte & Allen, 2000); Transtheoretical Model (i.e., Prochaska, DiClemente & Norcross, 1992; Prochaska et al., 1994; Rosen, 2000) and the Stage Model (de Hoog et al., 2007). However, these mini-literatures are often completely independent of one another so direct comparison between HBTs is problematic. This means that there is no reliable way to answer the question: is Model A better than Model B in predicting/explaining health behaviour X? Therefore, the fragmented literature remains stagnant – failing to benefit of cumulative scientific knowledge (Johnston & Dixon, 2008). Noar et al. found that out of 2901 articles published between 1974 and 2003 which were identified as relating to HBTs, only 178 (6%) contained more than one HBT in the search record. Of those 178 only thirteen (0.4% of the total sample) were identified as true theoretical comparisons. This suggests that at the time, theoretical comparisons were very rare. This trend has shown few signs of abating in more recent years (however see Bish, Sutton & Golombok, 2000; Dolman & Chase, 1996; Garcia & Mann, 2003; Murray-Johnson et al., 2001; Quine, Rutter & Arnold, 1998; Seydel, Taal & Wiegman, 1990; Vanlandingham, Suprasert, Grandjean & Sittitrai, 1995 and Wulfert & Wan, 1995 for some notable exceptions).

The large number of HBTs coupled with the lack of research comparing these models means that the research literature is fragmented and confusing (cf. Michie et al., 2005). There is currently no consensus concerning which model is the most accurate and precise in explaining health behaviour (Noar et al., 2005). Glanz and Maddock (2000) argue for a sort of natural selection of models whereby the *best* models out of the candidate set of models will rise to the top becoming more popular with researchers. In support of this view, there are certainly models which are certainly more popular with researchers including the Theory of Planned Behaviour, Health Belief Model, Transtheoretical Model, and Social Cognitive Theory (Noar et al.). However, given the dearth of empirical comparisons between models, it is unlikely that these models are being selected by researchers on the basis of being the most precise or accurate for a particular health behaviour. It has been noted that health promotion practitioners rarely provide a rationale for their choice of theoretical model (Green, 2000). When forced to provide a rationale it rarely includes empirical evidence in support of the chosen HBT over competing theories (Noar et al.). There must be other reasons why certain models are more popular than others.

Arguably, HBTs are often accepted by researchers on the basis of their simplicity, intuitive appeal, ability to be easily tested and researcher’s theoretical or philosophical leanings (Achterberg & Miller, 2004; Hoffman, 2003). If this viewpoint is true, it means that HBTs are really academic ‘products’ which need to be ‘sold’ to other researchers and practitioners. But models are not sold on the basis of their relative explanatory power as the evidence needed to make such judgements is lacking. If we are truly interested in increasing our understanding of health behaviour the most important consideration should be: is this theory the most precise and accurate model for explaining health behaviour? In order to answer this important question we need to directly compare HBTs.

Theories need to be directly compared in order to make assertions about whether one is more accurate than another (Noar et al., 2005). Investigating individual HBTs in isolation protects inferior theories from being recognised as an inferior account of health behaviour relative to other explanations in the literature. Therefore, there is little quality control in the literature and little impetus for HBTs to develop in order to improve their explanatory power. To remedy this we need a large body of research comparing HBTs in terms of their explanatory power for a number of health behaviours. For instance, the outcomes of a line of research comparing Model A with Model B may reveal that:

1. Model A is clearly superior to Model B in all circumstances. This finding may force researchers to reject Model B outright, reducing the candidate set of HBTs and effectively simplifying the literature in the process. Alternatively researchers may modify and recast Model B increasing its explanatory power in the process. Modifications to theory do occur but only quite infrequently and models are rarely completely discarded (Noar et al.). A reason for this may be that theories are not often compared. This means that the inadequacy of inferior models is rarely highlighted in an explicit fashion.

2. Model A is superior to Model B for some behaviours/populations but not others. This would allow researchers and practitioners to select the model which is superior for a given situation. It may also prompt researchers to develop Models A and B so that they are each more universally applicable.
3. Model A and Model B are equivalent. This is the least likely scenario but would suggest that both models have equal merit.

In all three cases knowledge about the determinants of health behaviour is usefully furthered.

Model comparison also serves as a rigorous test of individual HBTs. Health behaviour models are designed to be an approximation of the factors which determine health behaviour. If Model A is a good approximating model it should have no trouble doing a better job of predicting health behaviour than rival models. Comparisons with rival models will either demonstrate the superiority of the model or highlight that it is an inadequate account prompting further theoretical development. As the number of comparison studies increases inferior HBTs will naturally be rejected, modified and rejected again on the basis of their explanatory power relative to the candidate set of rival models. Therefore, the literature should begin to converge on a single answer to the question: which model is the best explanation for health behaviour? Of course this may be overly simplistic. It is possible, even likely, that a single model will not emerge as the best approximating model for all health behaviours or all population groups. For example, the predictors of condom use among university students may be very different to the predictors of exercise behaviours among the elderly. Nevertheless model comparison should naturally converge on a single solution for each health behaviour or population over time.

In contrast, it is unlikely that the current direction of health behaviour research will naturally converge on a single solution. The mini-literatures around each HBT are mutually exclusive and tell us a lot about the individual HBTs investigated (and the individual constructs within those HBTs) but much less about the state of the health behaviour literature as a whole (Noar et al., 2005). Therefore, the health behaviour literature does not lend itself to converging on a single solution due to heretofore unresolved fragmentation within the literature. Developing an evidence base for a particular HBT is obviously important but it is also important to place that HBT in the broader context of a cumulative health behaviour literature (cf. Johnston & Dixon, 2008). This is necessary to bring together the disparate findings in the health behaviour literature into a cohesive whole and for researchers and practitioners to benefit from this cumulative knowledge.

Although very few studies compare the effectiveness of HBTs, there are a handful of studies which have. Such studies test the predictions of each of the models independently (using multiple regression, path analysis, structural equation modelling etc.) then compare the amount of variance explained by each (Noar et al., 2005). For example, Bish, Sutton and Golombok (2000) compared the health belief model (HBM) and TPB and found that the TPB explained a much greater proportion of the variance in intentions to obtain cervical screening (51%) than the HBM (4%). This suggests that the TPB is a much more useful model for predicting whether a woman will seek cervical screening than the Health Belief Model. Similarly Garcia et al., (2003) compared five health behaviour models (TRA, TPB, HBM, HBM + self-efficacy and the health action process approach) across two health behaviours (resisting crash dieting and breast self-examination). It was found that in both cases the health action process approach explained the greatest proportion of the variance followed closely by the TPB and HBM

+ self-efficacy. In these investigations self-efficacy and PBC were consistently found to be the strongest predictions of intentions. This finding led Garcia et al. to perform forward regression analyses in order to investigate whether any other factors predicted intentions after the effect of self-efficacy and PBC. In the crash dieting study a model containing susceptibility, outcome expectancy, self-efficacy and PBC emerged; in the breast self-examination study a model containing attitudes, subjective norms and self-efficacy emerged. More interestingly, in both cases each of these models explained a greater proportion of the variance than any of the models tested in the study. This suggests that model comparison not only highlights which models and constructs are superior in predicting particular health behaviours but may also lead to serendipitous findings whereby new integrated models can be developed. Integrated models which explain a greater proportion of the variance in health behaviour than any single model alone

The Case for Theoretical Integration

Investigation across HBTs reveals one consistent finding: No current HBT can consistently explain all or even most of the variance in health behaviour. It has been argued that on the whole theoretical models are inconsistent with, or do not fully explain the available data (Eagly & Chaiken, 1993; Hale & Dillard, 1995; Ogden, 2003; Weinstein, 2007). Health behaviour theories are often supported as evidenced by statistically significant effects supporting their predictions. However, meta-analytic reviews reveal that much of the variance in health behaviour remains unexplained by any single model (e.g., Armitage et al., 2001; de Hoog et al., 2007; Floyd et al., 2000; Harrison, Mullen & Green, 1992; McEachan et al., 2012; Milne et al., 2000; Rosen, 2000; Witte & Allen, 2000). This suggests that despite exhaustive study of health behaviours, current HBTs offer an incomplete or inaccurate account of the psychological processes that determine health behaviour.

To recap, there is currently a health behaviour literature which is fragmented; with several mini-literatures centring on individual HBTs, but little crossover between mini-literatures. There is also no single model which can explain all or even most of the variance in health behaviours consistently. This suggests that something is missing from each of the HBTs currently in the literature. However, we know from their respective mini-literatures that many of these HBTs make different or even unique predictions and each has at least some merit. Therefore, each model may have something to contribute to the literature as a whole, even if it explains a relatively small proportion of the variance in health behaviour. Perhaps then the predictive power of individual HBTs may be augmented by adding constructs from another. That is we can integrate and incorporate ideas from numerous HBTs in order to enhance the predictive and explanatory power of currently available models.

A number of important HBTs have developed through the integration of constructs from numerous models. For example, Ajzen (1991 pp. 184) notes that "Much of our knowledge about the role of perceived behavioural control comes from the systematic research program of Bandura and his associates (e.g., Bandura, Adams, & Beyer, 1977; Bandura, Adams, Hardy, & Howells, 1980)". Therefore, the TPB can be seen as an integration of the TRA and ideas taken from Bandura's (1986) Social Cognitive Theory. The addition of PBC to the TPB significantly increased its explanatory power and allowed it to be applied to explaining non-volitional behaviours (Ajzen, 1991, 2011). Similarly, a major difference between PMT and PMT-R is the addition of self-efficacy to the model, which also occurred as a result of Bandura's work (Rogers, 1983). The EPPM is a merging of ideas from PMT-R, the parallel response model and the drive theories (Witte, 1992). The Stage Model incorporated features of the EPPM and Heuristic-Systematic Model in order to explain how fear appeal message information is processed (Das et al., 2003; de Hoog et al., 2005, 2007, 2008). As such, theoretical integration has been instrumental in the development and improvement of new health behaviour theory. However, despite these promising findings resulting from theoretical integration the health behaviour literature is still significantly fragmented. As such, there is no reason to believe that integrating ideas from current models will not lead to further important developments in theory and improvement in the prediction and explanation of health behaviour.

Hagger (2009) identified three arguments in favour of theoretical integration, it can: eliminate explanatory gaps in theories, reduce redundancy and increase parsimony. Other researchers agree that combining social-cognitive models may be a useful next step in the development of health behaviour theory (e.g., Armitage et al., 2000; Fishbein et al., 2001; Leventhal & Cameron, 1987; Maddux, 1993; Plotnikoff, Rhodes et al., 2009; Plotnikoff et al., 2010).

Eliminating explanatory gaps in theory.

Although there are often similarities between HBTs, there are also important differences. Different HBTs approach the problem of predicting behaviour in different ways. For example, PMT-R aims to describe the conditions under which an individual will become motivated to protect themselves from a health threat (Rogers, 1983), whereas the Transtheoretical Model focuses on describing how individuals progress through discrete stages of change (Prochaska et al., 1992; Prochaska et al., 1994). Plotnikoff et al., (2010) argued that PMT-R makes specific predictions regarding how predictors combine to predict health behaviour – whereas this is lacking in the

Transtheoretical Model. However, the Transtheoretical Model describes discrete stages individuals must pass through when making a change in behaviour, a prediction not included in PMT-R (cf. Prochaska et al., 1983; Prochaska et al., 1992). Lippke et al., (2009) demonstrated that stage of change moderated the effect of the PMT-R variables on intentions to exercise. This finding identified that important determinants of intentions and behaviour differ as a function of individuals' stage of change. For example, severity was an important determinant of intentions for those not contemplating change, but not for those contemplating change, preparing to make a change or currently in the process of making a change. This finding broadened the applicability of the PMT-R by demonstrating that it can be utilised to make specific predictions for individuals in different stages of change. This example demonstrates that individual HBTs make complimentary predictions leading to increased applicability of the models, the generation of new predictions and as a result increased understanding of the determinants of health behaviour. Therefore, other attempts to integrate the predictions of individual HBTs may also be beneficial (Maddux, 1993; Nigg, Allegrante & Ory, 2002). This may increase the explanatory power or applicability of current HBTs, effectively creating a better model in the process.

The models described thus far each contain some unique constructs and predictions and focus on different aspects of the behaviour change process. For example, both the PMT-R and EPPM do not explicitly incorporate social influences (i.e., injunctive and descriptive norms) or attitudes as factors which may impact on health behaviours. However, TPB research has shown that each of these variables are important predictors of health intentions and behaviour (e.g., Godin & Kok, 1996; McEachan et al., 2011; Rivis et al., 2003). The TPB also makes explicit links between attitudes, intentions and behaviours. Perhaps incorporating these predictions into the

PMT may increase its explanatory power. The revised form of PMT incorporates perceptions of threat and response-efficacy which are not explicitly included in the TPB. Further the EPPM, PMT and Stage Model make predictions concerning health message effects whereas the TPB does not. Perhaps integrating predictions from these models would allow the TPB to be applied to predicting the effects of a health message. Therefore, we have a situation where the predictions of one model compliment the others. This suggests that the predictions of the EPPM, Stage Model, RPA and TPB may complement one another and if incorporated into a single model could provide a richer account of the factors which determine health behaviours than any single model alone.

Reduce Redundancy.

Hagger also suggests that attempts to integrate HBTs will highlight redundancies between HBTs. Constructs between HBTs are often very similar but this is not immediately obvious because similar constructs are often labelled or measured differently between theoretical models (cf. Hagger, 2009; Maddux, 1993; Noar et al., 2005; Noar & Mehrotra, 2011; Weinstein, 1993). These inconsistencies create a literature which is unnecessarily confusing and therefore inaccessible to health promotion practitioners (Michie et al., 2005). A casual observer could be forgiven for thinking that individual HBTs make entirely unique predictions. However, careful observation often reveals that individual HBTs differ only by a single variable or different combinational rules for explaining behaviour (Noar et al., 2005). Often the similarities between theories outweigh the differences (Maddux, 1993). This means that the health behaviour literature is actually less fragmented than it initially seems; as many HBTs have converged on similar conclusions and the differences between HBTs are often more semantic than conceptual. For this reason researchers have argued that empirical comparisons between complete HBTs may be of limited value due to the similarities between HBTs (e.g., Maddux; Rogers et al., 1997). Therefore, much of the work in reconciling the literature may be simply identifying and highlighting similarities between constructs and agreeing on a common vocabulary between HBTs.

Investigating whether a construct is redundant can be achieved by entering constructs from separate HBTs hierarchically and investigating whether constructs from model Y add significant variance to constructs from model X (cf. Hagger et al., 2002b; Nejad et al., 2006). Constructs from model Y which contribute unique variance to the model after controlling for constructs from model X can be deemed important additions to model X; those which do not are redundant. That is if construct B from model Y is redundant, then it will not contribute to an integrated model of health behaviour after controlling for the effect of constructs from model X (i.e., B will not contribute unique variance). When this occurs we can infer that B is not an important predictor of health behaviour in the integrated model. This may lead researchers to reject the effect of B on health behaviour as spurious, effectively removing it from consideration within the literature. Alternatively it may be recognised that construct A from model X and B actually represent the same (or very similar) psychological construct. Another option may be that the effect of B on health behaviour is an indirect relationship as mediated by A. Highlighting redundancies in this way would serve to refine and simplify the health behaviour literature as a whole and highlight important relationships between HBTs.

Self-efficacy/PBC. There are a number of constructs between the HBTs discussed above that are essentially identical or at least conceptually similar to one another. For example, there is debate concerning whether PBC and self-efficacy should be considered to be similar constructs (Ajzen, 2002; Conner et al., 1998). Many researchers have opted to separate PBC into two components: perceived self-efficacy and perceived controllability, showing evidence that these constructs are indeed distinct (e.g., Ajzen, 2002; Armitage et al., 1999a, 1999b; Conner et al., 1998; Hagger & Chatzisarantis, 2005; Hagger et al., 2002a, 2002b; Rhodes & Courneya, 2003; Terry et al., 1995; Trafimow, et al., 2002; White et al., 1994). This suggests that PBC may simply be a broader but conflated construct which encompasses self-efficacy and perceived controllability. If that is the case it is worth considering the impact of perceived self-efficacy and perceived controllability separately as each is conceptually distinct and may impact on behaviour in different ways.

However, perceived controllability and self-efficacy are likely to impact one another. They are often found to correlate either moderately or strongly with one another (e.g., Armitage et al., 1999a, 1999b; Hagger et al., 2002b; Hagger et al., 2005; Povey et al., 2000a). If a person believes that adopting a healthy diet, for example, is not under their volitional control (low perceived controllability) they are not likely to believe that they have the requisite skills and resources to adopt a healthy diet. Similarly individuals who believe they can successfully adopt an exercise program (high self-efficacy) must also believe that they have control over whether they adopt the program or not (high controllability). However, an individual can believe that they are in control of how much exercise they do (high controllability), but not believe that they are capable of adopting an exercise program (low self-efficacy). These examples highlight that high perceived controllability may be a prerequisite for high self-efficacy but does not necessarily entail high self-efficacy. In support of this,research shows that the addition of self-efficacy to a model containing perceived controllability often leads to a significant attenuation (often to non-significance) of the effect of perceived controllability on intentions and behaviour (e.g., Armitage et al., 1999a, 1999b; Hagger et al., 2002b; Hagger et al., 2005; Povey et al., 2000a). As such, self-efficacy may mediate the relationship between perceived controllability and behaviour. A mediative relationship between perceived controllability, self-efficacy and behaviour has not been investigated in the extant TPB literature.

Attitudes. According to the TPB attitudes are comprised of two sets of beliefs: beliefs about the anticipated outcomes of a behaviour (behavioural beliefs), and beliefs about the whether these outcomes are favourable or unfavourable (subjective evaluation). It has been argued that components of perceived threat within the PMT-R (i.e., susceptibility and severity) may be example of these beliefs (Maddux, 1993; Rogers et al., 1997). Susceptibility may be conceptualised as a perceived outcome of not engaging in the suggested health behaviour (i.e., "if I keep smoking I will increase my chances of developing lung cancer"). Perceptions of severity could be conceptualised as unfavourable evaluations of developing a health problem (i.e., "lung cancer is a serious and life-threatening disease"; Maddux). Beliefs about one's susceptibility to a severe illness should lead to more negative attitudes concerning the current unhealthy behaviour (cf. Rogers, 1983, 1984; Rogers et al.) and as a result more positive attitudes about proposed changes in behaviour, especially if these are believed to be effective in alleviating the health risk. Therefore, beliefs about the efficacy of a particular response in alleviating the health risk (i.e., response-efficacy) could also be conceptualised as a behavioural belief concerning that response. It can be safely assumed that this would be a positive belief as it is unlikely that anyone would view increasing one's health as a bad thing. Rhodes, Plotnikoff and Courneya (2008) found that attitudes were positively associated with susceptibility, severity and response-efficacy. However, the effect sizes for susceptibility and severity were relatively small. This suggests that the EPPM constructs of susceptibility, severity and response-efficacy may be determinants of attitudes within the TPB. As such, the effect of these variables on intentions and behaviour may be mediated by attitudes.

Many similarities between models have been identified and discussed above (see also Bandura, 1998; Maddux, 1993; Murray-Johnson et al., 2001; Nigg et al., 2002; Noar et al., 2005; and Weinstein, 1993 for further discussion of similarities between HBT constructs). However, many others may be discovered through direct comparison of models and theoretical integration. When two or more theories are considered together any similarities between these models will naturally emerge. This may occur through the experimenters generating and testing hypotheses concerning relations between variables or serendipitously through exploratory analyses (i.e., investigation of correlation matrices across HBTs).

Increase Parsimony

Finally theoretical integration can increase parsimony. Initially this may seem like a contradiction in terms. Integrating two or more HBTs will likely yield an integrated model which is *more* complex than either of its constituent HBTs. If we think about complexity in terms of the individual models involved then this assessment is correct; theoretical integration is likely to increase complexity of individual models. However, if we think about it in terms of the health behaviour literature as a whole, then theoretical integration can decrease complexity in a number of ways. Firstly the integrated model may explain a greater proportion of the variance in health behaviour than any of the individual HBTs. This means that it allows for a better prediction and explainion of health behaviour. The unexplained variance in health behaviour is what makes its prediction so difficult. Therefore decreasing unexplained variance decreases complexity. Further in many cases the integrated model would effectively subsume two separate HBTs therefore the constituent HBTs can now be rejected. Secondly, combining constructs from separate HBTs may highlight redundancies between HBTs. This means that the integrated model may not be simply the sum of the constructs from each of the constituent HBTs, but a refined version of these constructs. This means that not only are two HBTs combined to create one, but the integrated model is less complex than the sum of the constructs in individual HBTs.

Decreasing the complexity of the health behaviour literature as a whole is very important. There is dizzying array of constructs which have been shown to determine health behaviour in one way or another. To illustrate, a short list would include: attitudes, subjective norms and perceived behavioural control (Ajzen, 1985, 1987,1991; Ajzen et al., 1986); fear, threat and efficacy (Witte,1992a, 1994; Witte & Allen, 2000); susceptibility, severity, self-efficacy and response-efficacy (Floyd et al., 2000; Milne et al., 2000; Rogers, 1975, 1983; Witte & Allen, 2000); mortality salience (Jessop & Wade, 2008); trait anxiety (Witte & Morrison, 2000) costs and benefits (Harrison et al., 1992); locus of control (Norman, Bennett, Smith & Murphy, 1998; Hagger & Armitage, 2004); information processing – positive and negative thoughts, positive thoughts about the recommendation, minimising thoughts (de Hoog et al., 2005, 2007, 2008); peer norms and identification (Chatzisarantis, Hagger, Wang & Thøgersen-Ntoumani, 2009); extraversion, neuroticism and conscientiousness (Courneya, Bobick & Schinke, 1999), implementation intentions (Gollwitzer, 1993; Gollwitzer & Sheeran, 2006); positive and negative emotion (Bagozzi, Baumgartner & Pieters, 1998); belief salience, moral norms and self-identity (Conner et al. 1998); self-determined motivation (Hagger & Chatzisarantis, 2008, 2009); mindfulness (Hagger et al., 2007); and need for cognition (McMath & Prentice-Dunn, 2005). While each of these findings has contributed to our understanding of the determinants of health behaviour, we have little idea of how these variables combine to determine health behaviour or whether some are redundant or spuriously related to health behaviour. These variables are of limited usefulness unless they are placed within a broader multitheoretical framework. Engaging in theoretical integration provides a potential method for achieving this.

Therefore, theoretical integration may be useful in reconciling the health behaviour literature. Optimally, integrated models should be compared to existing models to ensure that they are effective in predicting a variety of health behaviours across a variety of populations. Efforts should be made to continue to improve the prediction of health behaviour. Several different ways of integrating HBTs should also be considered, investigated and compared in order to arrive at the best possible prediction of a health behaviour. Therefore, utilising theoretical integration and model comparison over time should naturally lead to continued improvements and refinement of HBTs. This should improve our prediction of health behaviour. This improved understanding can in turn be utilised to guide effective intervention programs to motivate individuals to engage in healthier behaviours.

Chapter 3: Broad Thesis Aims and Specific Aims of the Studies Presented

The overarching aims of this thesis are to: 1) investigate whether the TPB and PMT-R each represent a complete and sufficient description of the psychosocial determinants of health behaviour; 2) compare the TPB and PMT-R for their effectiveness and accuracy in predicting health behaviours; and 3) develop integrated models of health behaviour which combine predictions from existing health behaviour models, and test the predictions of these integrated models.

Aim 1: Investigating the Sufficiency of Existing Models

Ajzen (1991) argued that behavioural intentions are determined by individuals' attitudes, subjective norms and PBC, and their behaviour is determined by intentions and PBC. He argued that other psychosocial determinants would exert their influence on intentions and behaviour via their influence on individuals behavioural, normative and control beliefs (i.e., beliefs underpinning attitudes, subjective norms and PBC respectively). That is Ajzen (1991) assumed that the TPB was a sufficient explanation of volitional behaviour. If this is accurate then the TPB variables should fully mediate the effect of any other psychosocial predictors on intentions and behaviour. No other psychosocial predictor should exert any unique effect on intentions or behaviour (cf. Ajzen, 2011). This logic was applied in the studies presented in this thesis in order to judge whether a health behaviour model is a sufficient explanation of the health behaviour or health behaviour intentions under investigation. This was achieved by investigating whether an existing health behaviour model's prediction of behaviour or intentions can be improved with the addition of predictors outside of that model's framework. According to Ajzen's (1991, 2011) logic, if a model is a sufficient explanation of intentions and behaviour, the addition of predictors outside that model's framework will not add additional unique variance after controlling for the predictors contained in the model. Therefore, if these added predictors do add unique variance it can be inferred that the model is incomplete as its prediction of behaviour or intentions can be improved through the addition of predictors not included in the model.

Aim 2: Comparing Existing Theoretical Models

Comparing competing explanations for phenomena is important for developing knowledge in an area of research. Health behaviour models can be directly compared to investigate which model is the most accurate (i.e., explains the greatest proportion of the variance in an outcome). It ensures that more accurate models are identified as such and more widely applied; and less accurate models are either rejected or reformulated to conform more closely to observations. In the previous chapter it was noted that there are dozens of health behaviour models each purporting to explain individuals’ health behaviour (cf. Noar et al., 2005). Some of these models are almost certainly more accurate than others. However, it is not clear which models are the most accurate as models are rarely compared for accuracy (Noar et al.). The studies presented herein directly compared the predictions of health behaviour models across a number of health behaviours. A common sense approach to comparing current models of health behaviour was employed. Each model was investigated independently for how well its constructs predict health behaviour and related outcomes. Each model is then compared statistically (using Akaike Information Criterion values) to determine which is the most parsimonious model which explains the greatest proportion of the variance in the relevant outcomes. This allows for the most accurate model of a candidate set of models to be identified. Such research findings are useful for practitioners looking to base interventions on health behaviour theory as they allow them to make an informed decision regarding which model/s they should utilise to maximise the accuracy of their predictions.

Aim 3: Theoretical Integration

As discussed in Chapter 2, theoretical integration may be a useful means of improving the explanatory power of current health behaviour models and may guide the development of new models. The integrated models devised in the present work are derived through hypothesising relationships between variables from separate models. The predictions of the constituent models are then combined into a cohesive whole. The predictions of the resultant integrated models are consistent with the available evidence where possible. Other predictions are developed using the definitions of the constructs involved and reasonable inferences concerning how these constructs may be related. As such, to date many of the predictions are unique and have not been investigated in the extant health behaviour research. The predictions of the integrated models are then investigated in order to ascertain whether they represent viable models of health behaviour.

What this Thesis Does Not Aim to Achieve

The studies described herein are an attempt to promote methods of improving the prediction of health behaviour over time through cumulative research. Currently health behaviour researchers appear to be mostly concerned with proliferating and testing theory in a vacuum – as if other models just do not exist (Noar et al., 2005). This leads to a fragmented literature which fails to develop our overall understanding of the psychosocial determinants of health behaviour. This state of affairs may be rectified by utilising methodologies that employ model comparison or theoretical integration (cf. Hagger, 2009, 2010; Noar et al.).

The studies presented in this thesis are simply examples of how model comparison and theoretical integration can be applied to the prediction of health behaviour. Accordingly, given the large number of health behaviour models currently in the literature this thesis does not aim to find the most accurate health behaviour model in existence. Achieving this would require a much larger research effort and likely hundreds of studies applying different models to the prediction of different health behaviours. Nevertheless, the research does show that of the models investigated, some are more accurate and useful than others for prediction health behaviour and intentions. This suggests that methodologies that utilise model comparison are useful for highlighting which model is a better explanation for health behaviours or intentions.

Similarly, the integrated models developed for this study are not designed or intended to be definitive models of health behaviour. These models were designed as frameworks for the development of hypotheses across current health behaviour models. However, they are not intended to be static and unchanging definitive models of health behaviour. The predictions of these models are preliminary and open to change with disconfirming evidence. Nevertheless the integrated models also generated several novel predictions. Therefore, they are useful in developing an understanding of the determinants of the health behaviours under investigation. Although the current research program may not result in finding the best health behaviour model currently conceived, it does showcase the utility of model comparison and theoretical integration as methods for improving our understanding of the psychosocial determinants of health behaviours over time.

Overview of the Studies Presented

Each of the studies presented address one or more of the three broad thesis aims discussed above. However, they also each have a set of specific aims. The studies also build in terms of complexity. Study 1 investigates a single health behaviour model and investigates whether it can be augmented with the addition of a single variable. Studies 2 and 3 aim to compare the predictions of two existing health behaviour models (PMT-R and TPB) and test the predictions of an integrated model which combines the predictions of these models. Study 4 builds on the integrated model devised in Studies 2 and 3 by developing and testing the predictions of an integrated model which combines the predictions of four separate existing health behaviour models in a three part study.

Study 1: Investigating the Effect of Health Knowledge on Individuals Responsiveness to Fear Appeal Messages

Study 1 aimed to investigate the effect that individuals' health knowledge has on how they respond to a fear appeal message. Protection Motivation Theory was utilised as a theoretical underpinning for the project. This model was applied as several recent studies have applied PMT-R as a framework for predicting exercise intentions (e.g., Lippke et al., 2009; Plotnikoff et al., 1995, 1998, 2002; Plotnikoff, Rhodes et al., 2009; Plotnikoff, Trinh, et al., 2009). Participants were presented with health information regarding the health effects of obesity and ways of maintaining healthy weight. This was followed by either a moderately or highly threatening health message related to the health effects of obesity, or a benign message unrelated to health. Participants then completed measures of PMT-R constructs (susceptibility, severity, response-efficacy, self-efficacy and costs), intentions to maintain a healthy diet and exercise regularly and retention for the information presented to them previously. The aims of the project were threefold: 1) to investigate whether the presentation of a threatening health message impacts on individuals' capacity to retain relevant health information; 2) to investigate whether individuals' existing health knowledge moderates the impact of a fear appeal message on intentions to engage in health protective behaviour; 3) to investigate whether individuals' health knowledge is an important predictor of intentions to engage in health protective behaviour. As such, Study 1 was primarily directed at investigating whether individuals' health knowledge is an important outcome to consider in fear appeal research – i.e., is it related to individuals behavioural intentions and does it affect how individuals respond to fear appeal messages.

Study 2: Comparing and Integrating the Predictions of Protection Motivation Theory and the Theory of Planned Behaviour in the Context of Smoking.

In Study 2, participants completed measures of the PMT-R constructs, TPB constructs (attitudes, injunctive and descriptive norms, perceived controllability and self-efficacy), intentions, past behaviour and relevant health knowledge. The study aimed to investigate the predictions of PMT-R and TPB and compare these models for their utility in explaining intentions to quit smoking, use nicotine patches and avoid situations where smoking cravings regularly occur. In addition, an integrated model which combines the predictions of PMT-R and TPB was devised and tested. The integrated model was based on Maddux's (1993) revised theory of planned behaviour. However, it made several novel predictions including that response-efficacy may represent a behavioural belief underpinning individuals attitudes and that the effect of perceived controllability on intentions should be mediated by self-efficacy.

Study 3: Comparing and Integrating the Predictions of Protection Motivation Theory and the Theory of Planned Behaviour in the Context of Obesity, Diet and Exercise.

Study 3 represented a replication of Study 2 in a different health context – obesity, diet and exercise. As such, the aims and methodology for the study are identical to those for Study 2 but focusing on diet and exercise rather than smoking behaviour. However, the sample size for Study 3 is much larger and threat*efficacy interaction effects are also investigated. This allows for investigation of whether efficacy perceptions moderate the effect of threat on diet and exercise intentions. As such, similar to Study 2, Study 3 aimed to compare the PMT-R and TPB for their ability to predict diet and exercise behaviour intentions. It further aimed to test the predictions of an integrated model which combines predictions of PMT-R and TPB.

Study 4: Development and Testing an Integrated Model of Fear Appeal Outcomes.

Those who completed Study 3 were given the option of continuing their participation by completing a second part of the research. In this second part of the research participants were presented with one of three threat messages (low, moderate, high) and one of two efficacy messages (low, high). They then completed measures of fear, defensive message processing and fear control responses (defensive avoidance, reactance; cf. Ruiter et al., 2003; Witte, 1992b, 1994). Participants then completed identical measures of all the constructs measured in the first part of the research (i.e., susceptibility, severity, self-efficacy, response-efficacy, attitudes, injunctive norms, descriptive norms, perceived controllability, intentions and health knowledge). One month later participants returned to complete measures of the health behaviour over the month following their participation in the study.

This study was designed to test another integrated model of health behaviour. The model combined predictions from the EPPM, Stage Model, TPB and RPA. The model tested in Study 4 retained many of the predictions of the integrated model tested in Studies 2 and 3 but added several new predictions. These new predictions concerned individuals' responses to the health messages presented based on the message content and their existing perceptions of threat and efficacy. Similar to the EPPM and Stage Model, the integrated model aimed to predict both adaptive (i.e., attitudes, intentions, and behaviour) and maladaptive (i.e., minimising thoughts, defensive avoidance, reactance) responses to the health messages. However in contrast to these models, the integrated model made specific predictions concerning how individuals' psychographic characteristics should influence their response to a health message. The integrated model also makes several unique predictions concerning the relationships between constructs of the EPPM, TPB and Stage Model.

Each of the studies described in this thesis address one or more of the broad thesis aims. Study 1 addresses aim 1 only, Studies 2 and 3 address all three aims, and Study 4 addresses aim 3 only. Taken together the studies discussed herein constitute a strong case for the use of model comparison and theoretical integration as methods for improving our understanding of the psychosocial determinants of health behaviour. The studies highlight that current models of health behaviour are suboptimal and the addition of further predictors can improve the predictive power of these models. It is also shown that not all models of health behaviour are created equal – some are able to provide more accurate predictions of health behaviour than others. Finally it is shown that theoretical integration can be utilised to develop unique predictions, highlight relationships between constructs across existing health behaviour models and increase the explanatory power and scope of current models of health behaviour. Although many of the unique predictions of the integrated models investigated in this thesis were not supported by the evidence, others garnered considerable support across a wide range of health behaviours. These findings represent unique additions to the health behaviour literature and usefully develop our understanding of the psychosocial determinants of health behaviours.

Chaters 4-7 represent a full account of Studies 1-4. These chapters will each be organised similarly to a research report. An introduction will lay the background for the research and its theoretical underpinnings paving the way for specific hypotheses to be drawn. For Studies 2-4 the introduction will also contain a section outlining how the study builds upon or addresses the limitations of the study/ies which preceded it. This will be followed by a full description of the methodology for the study. The results of the study will then be presented followed by a discussion of these results, the theoretical and practical implications of the findings and limitations of the study. The final chapter of the thesis will then discuss the overarching implications of the research programme, its limitations and some suggested directions for future research in this area.

Chapter 4: Study 1 – Investigating the Effect of Health Knowledge on Individuals Responsiveness to Fear Appeal Messages

A tacit assumption underlying theoretical accounts of fear appeal effectiveness is that the health information contained in the fear appeal message is important in determining persuasive outcomes. It is assumed that a key reason why individuals make poor health choices is that they lack the requisite information to make healthy decisions concerning their health behaviours (Fishbein & Ajzen, 2010). On the basis of that logic, informing individuals about a health problem should naturally lead to a reduction in unhealthy behaviours in favour of healthier ones. It is this information which message designers use to manipulate respondents threat and efficacy appraisals. It is assumed that individuals make judgments concerning the relevance of the health threat and their coping resources on the basis of the health information contained within the fear appeal message (cf. Argo & Main, 2004; Rogers, 1975, 1983; 1984; Witte, 1992a). However, Nabi, Roskos-Ewoldsen and Carpentier (2008) argued that individual's certainty of their perceptions of threat and efficacy will be constrained by the amount of relevant knowledge they possess. If individuals possess little relevant knowledge they cannot draw firm conclusions concerning the relevance and severity of a presented health threat and their capacity to cope. Therefore, fear appeals can only affect threat and coping appraisals to the extent that the health information contained in the message is attended to, comprehended and retained over time. As such, the retention of health information is likely to be a necessary precondition for fear appeal persuasiveness (cf. Argo et al.; McGuire, 1980, 1984).

Although the aims of large scale fear appeal campaigns include disseminating health information and increasing awareness about a specific health problem (e.g., Andersen et al., 2009; National Binge Drinking Campaign, 2009; National Tobacco Campaign, 2000), fear appeal theory has largely ignored the impact that gains in health knowledge may have on persuasive outcomes. McGuire (1980, 1984) argued that in order to act on the recommendations of a health message the information must be retained and recalled when necessary. However, the influence that gains in health knowledge have on adaptive outcomes has yet to be investigated in the extant fear appeal literature. Therefore, the extent to which information retention impacts on adaptive outcomes is unclear. It is also unclear whether fear appeals impact on respondent's capacity to process and retain health information.

Relationship between Health Knowledge and Behaviour

A relationship between health knowledge and protective behaviour makes intuitive sense. In order to adopt protective behaviour individuals must possess the requisite knowledge concerning the presence of a health risk and the responses which are effective in alleviating that health risk. An obese individual is unlikely to exercise in order to lose weight if they are unaware that obesity is associated with adverse health outcomes and regular exercise is an effective means of losing weight and mitigating these health outcomes. However, bivariate associations between health knowledge and intentions/behaviour are generally weak or non-significant (e.g., Hornik, 1989; Rimal, 2000; Rimal, Böse et al., 2009; Sheeran & Taylor, 1999) or mediated by other factors such as perceived behavioural skills or self-efficacy (e.g., Fisher, Fisher, Williams & Malloy, 1994; Misovich, Martinez, Fisher, Bryan & Catapano, 2003; Rimal, 2000). Researchers argue that health knowledge is a necessary, but not a sufficient condition for determining behaviour (Fishbein & Ajzen, 2010; Fisher & Fisher, 1992, 2000; Misovich et al.). These weak correlations are of concern as from a health promotion perspective increasing individuals relevant health knowledge is only useful if it ultimately translates into changes in health behaviour. To address this concern recent research has investigated factors which may moderate the knowledge-behaviour gap.

Rimal (2000) posited that the knowledge-behaviour correlation should be moderated by perceived self-efficacy. It was argued that individuals who do not believe that they are capable of adopting health protective behaviour will not do so regardless of their health knowledge. In this case individuals possess relevant knowledge but believe that they are incapable of adopting the behaviour – which in turn impedes their adoption of the behaviour. However, when self-efficacy is high the relationship between knowledge and behaviour should be stronger as individuals possess the requisite knowledge and believe they possess the skills to successfully adopt the behaviour. Rimal provided evidence that knowledge is positively associated with behaviour regardless of one's level of self-efficacy. However, for individuals high in self-efficacy the knowledge-behaviour link was stronger than for those who possessed low or moderate self-efficacy. Increases in self-efficacy were also associated with increases in health knowledge and behaviour. As such, the observed associations between health knowledge and behaviour may have in part reflected the associations of both variables with self-efficacy. Therefore, the relationship between health knowledge and behaviour may be mediated by self-efficacy. This finding supports the predictions of the Information-Motivation-Behavioural skills model which suggests that perceived behavioural skills (a construct very similar to self-efficacy) mediates the effect of health knowledge on behaviour (Fisher et al., 1992). Empirical findings support the proposed mediated relationship between health knowledge and behaviour (Fisher, Fisher et al., 1994; Misovich et al., 2003).

Nabi et al. (2008) argued that individual's relevant knowledge concerning a health issue may affect how they respond to a health message targeting that health issue. Individuals with high levels of health knowledge are likely to already be aware of the health information in the message and thus the message may be perceived as patronising or paternalistic. This effect is likely to be more pronounced when the message is designed to be threatening. Knowledgeable individuals are not likely to increase their estimations of personal threat as a result of such a message as it presents little new information. The fear appeal message should not evoke fear arousal for the same reason. As a result, the message is unlikely to motivate attitude, intention or behaviour change for such individuals. Therefore, individuals with high levels of health knowledge are likely to have perceptions of personal threat which are stable and resistant to counter-persuasion; as a result they are unlikely to respond to fear appeal messages. Nabi et al. argues that the fear appeal message may evoke reactance in knowledgeable respondents interfering with persuasive outcomes or even leading to increases in undesirable behaviour (cf. Brehm, 1966; Brehm & Brehm, 1981; Erceg-Hurn et al., 2011; Jessop & Wade, 2008). In contrast it was argued that those with poor knowledge should be more likely to respond to fear appeals as their perceptions of fear and threat are more amenable to manipulation (see also Chailland & Raatz, 2008).

Nabi et al. (2008) found that individuals who perceived themselves to be knowledgeable were more likely to endorse positive attitudes concerning testicular (male) and breast (female) self-exams following a non-threatening message when compared with low or high threat messages. No such differences were found for participants who perceived their knowledge to be low. However, no main or interaction effects were found for intentions to engage in self-exams. It was also found that knowledgeable individuals were more likely to feel that the threatening messages were manipulative when compared with the non-threatening message. Chailland and Raatz (2008) employed a similar methodology, but formally tested relevant health knowledge through a series of four true or false questions. They found similar trends, though the effects were non-significant; knowledgeable individuals were more likely to change their attitudes concerning soft-drink intake in response to a low threat message, whereas non-knowledgeable individuals were more likely to respond to a high fear message. The above findings suggest that health knowledge may constrain the effectiveness of a fear appeal message such that threatening messages may be ineffective or even counterproductive for knowledgeable respondents.

Some methodological issues in the measurement of health knowledge may impede meaningful interpretation of the above results. For example, Nabi et al. measured participants perceived health knowledge, but did not measure *actual* health knowledge. Therefore, it was unclear whether participants who perceived themselves to be knowledgeable about the health issue actually had greater relevant knowledge. As such, the measure of health knowledge may have lacked validity. Both Challiand et al (2008) and Rimal (2000) employed small numbers of true-false items to assess participants' health knowledge. However, such measures of health knowledge are still problematic as the probability of receiving a correct answer on any of the items by chance is 50%. Rimal (2000) also employed multiple-choice items which may have also been problematic for similar reasons – i.e. high probability of chance responding. The small number of questions coupled with the high probability of correct responding meant that several participants in these experiments may have been erroneously identified as having high health knowledge due to chance responding alone. Further, with the limited response options even those with relatively poor health knowledge may be able to puzzle out the correct answer by eliminating obviously incorrect responses. These measurement issues suggest that the above findings may be underdeveloped and should be treated with scepticism.

Retention of Health Information

Several studies suggest that exposure to health messages is associated with increases in health knowledge (e.g., Challiand et al., 2008; Flora & Schooler, 1995; Rimal, 2000; Rimal & Flora, 1998; Rodrigue, 1996; Stewart, Wolfe, Maeder, Hartz, 1996; Wakefield, Freeman & Donovan, 2003). For example, Rodrigue found that individuals presented with health information regarding skin cancer and sun protection displayed an increase in health knowledge, whereas those who were not presented with health information showed no such gains over time. Those exposed to the health information also displayed increases in sun protective attitudes; intentions and behaviour at two week follow up. However, gains were significantly more pronounced and were most likely to be maintained over time for those who also attended an intervention aimed at changing attitudes concerning sun protection. This intervention included discussions of the health effects of excessive sun exposure and a personal testimony from a melanoma survivor. These findings suggest that increases in health knowledge may be a prerequisite for behaviour change to occur, but fear based interventions are likely to facilitate behaviour change beyond the effect of health knowledge alone.

The negative emotional arousal elicited by a fear appeal message may affect recall outcomes. Lang (2000, 2006) proposed that when exposed to messages which evoke negative emotions, individuals will tend to allocate cognitive resources to processing the message. However, when negative arousal becomes too aversive resources are allocated elsewhere as the individual prepares for a defensive response. An implication of this model is that fear appeal messages will tend to be recalled with greater accuracy than non-fear appeals, as long as the emotional impact of the message is not overwhelming (Leshner, Vultee, Bolls & Moore, 2010). Recent empirical findings suggest that moderately arousing fear appeal messages were better recognised than messages which were not arousing. However, when the elicited negative emotional arousal was very strong, recognition did not differ from non-arousing messages (e.g., Leshner, Bolls & Thomas, 2009; Leshner, et al., 2010). These findings suggest an inverted-U shaped interaction between negative arousal and recognition (cf. Janis, 1967). However, these findings only focused on recognition of fear appeal messages as a whole (i.e., “was I previously presented with this message?”). They did not assess participants’ recall of the specific health information contained within each fear appeal message.

Research suggests that when a message is emotionally charged, attention is oriented towards the threatening aspects of the message resulting in these features being more easily recalled. However, retention for peripheral information is poorer (Christianson, 1992; Christianson & Loftus, 1991). In research on fear appeals, Keller and Block (1996) found that individuals exposed to a low-fear appeal were more likely to recall behavioural recommendations to reduce the incidence of smoking than individuals exposed to a high fear appeal. However, recall for the threatening aspects of the message were not measured so could not be used as a comparison. Touryan, Marian & Shimamura (2007) investigated the influence of negative emotional arousal on memory for images. Participants’ memory for the central aspects of an image was enhanced when presented with negative emotional imagery compared with neutral imagery. However, memory for the associated peripheral aspects of the image was impaired. These results suggest that fear provoking information may enhance focus on the threatening content at the expense of other aspects of a message. Applied to fear appeals, these results suggest that respondents may pay undue attention to the threatening imagery and information at the expense of attending to the behavioural recommendations. This may result in poorer retention of the information pertaining to the behavioural recommendations – information which could be utilised to guide the adoption of protective behaviour. Therefore, the presentation of threatening health messages may interfere with individual's capacity to attend to and retain health information in an unbiased manner.

Research Aims and Hypotheses

The aims of the present study are threefold. Firstly we aim to investigate the whether the presentation of a threatening health message impacts on individual's capacity to retain relevant health information. Participants were presented with health information regarding the health effects of obesity and ways of maintaining healthy weight. This was followed by either a moderately or highly threatening health message related to the health effects of obesity, or a benign message unrelated to health. Later in the experiment participants were tested for their retention of the health information together with information not already presented. It was predicted that individuals exposed to the moderate-threat message would have greater health information retention when compared with those in the benign or high-threat condition.

A second aim of the present research is to investigate whether prior health knowledge moderates the impact of a fear appeal message on intentions to exercise and intentions to adopt a healthy diet. It was predicted that for knowledgeable individuals the low-threat message will lead to the greatest intentions, whereas for less knowledgeable individuals the high-threat message will lead to the greatest intentions. To address the limitations of previous research (i.e., Challiand et al., 2008; Nabi et al., 2003; Rimal, 2000) participants' health knowledge was assessed via fill in the gaps items whereby participants must formulate their own response to each item rather than choosing whether a statement is true or false (Nabi et al.) or selecting a response from a small number of responses (Rimal).

A third aim of this research is to investigate whether individual's health knowledge is an important predictor of intentions to engage in health protective behaviour. It is predicted that health knowledge will be positively associated with intentions. However, the effect of health knowledge on intentions should be mediated by self-efficacy (cf. Fisher et al., 1994; Misovich et al., 2003; Rimal, 2000). Whether health knowledge added to the prediction of intentions after controlling for the PMT-R variables was also investigated. Rimal, Böse et al., (2009) found that health knowledge concerning HIV/AIDS and condom use was a significant predictor of condom use intentions even after controlling for the effects of perceived susceptibility and self-efficacy. Rimal and Jose (2010) found similar results in the context of breast cancer screening. It was predicted that the PMT-R variables severity, susceptibility, response-efficacy, self-efficacy would each be positively associated with intentions, and costs would be negatively associated (cf. Rogers, 1983). Further, it was predicted that health knowledge would add significant variance to models of diet and exercise intentions after controlling for the effects of the PMT-R variables.

Method

Participants

A total of 83 participants (26 male, 57 female) were recruited in to the study. The mean age of participants was 25.18 (*SD* = 10.48). The mean body mass index (BMI) was 23.54 (*SD* = 4.58) which is at the high end of the normal weight range for the scale (18.5-24.9). Five participants (6.0%) were underweight (BMI < 18.5), 58 participants (69.0%) were within the normal weight range, 14 participants (16.7%) were overweight (BMI between 25 and 29.9) and six participants (7.1%) were obese (BMI > 30) according to their self-reported height and weight. Most participants were recruited from the undergraduate psychology program of a university in New South Wales, Australia via an online advertisement (*N* = 67), the remaining 16 participants were recruited from the general public via advertisement posters. Undergraduate participants received partial course credit for their participation, whereas the general public participants received no incentives or rewards.

Materials

Threat Message.

Participants were randomly assigned to view one of three threat messages (moderate threat, high threat or no threat). The content of the moderate and high threat messages was written by the researchers, the high threat message was designed to be considerably more threatening than the moderate threat message – focusing on the more severe health consequences of obesity. Before proceeding with the study a small focus group (*N* = 6) read both the moderate and high threat messages and unanimously selected the high threat message as being the most “fear provoking, unpleasant and threatening” of the two messages. The messages took the form of mock personal testimonials where the experiences of a single person were described. The moderate and high threat testimonials described the experiences of an individual whose health has been adversely affected by overweight or obesity. Following from previous fear appeal research, the high threat testimonial described more severe symptoms of obesity and used more vivid language (e.g., “She is covered in weeping bed sores from constantly lying in bed”) when compared with the moderate threat message (e.g., “I’m diabetic, have, high blood pressure and I’m tired all the time”). Similar personal testimonials have been utilised in fear appeal research to manipulate perceptions of threat (e.g., Cho & Salmon, 2006; Witte, 1992b, 1994; Witte, Berkowitz, Cameron & McKeon, 1998; Witte & Morrison, 2000). The no threat message was unrelated to health describing the experiences of a vacation group hiking up a mountain. This was chosen as it was believed to be relatively benign content which should be unlikely to evoke a negative emotional response or impact on perceptions of threat.

Presentation of health information.

Health information was presented to participants in the form of 13 discrete health facts related to the health effects of obesity (e.g., "obesity is associated with the development of osteoarthritis") and ways of reducing your risk to health (e.g., "you can reduce our risk of becoming obese by exercising at least 30 minutes per day"). These facts were taken from various government website, health brochures, medical textbooks and other sources (e.g., AIHW, 2010; ABS, 2010; Beers, Fletcher, Jones, Porter, Berkwits & Kaplan, 2003). To ensure that participants gave consideration to each of the facts they were asked to rate whether they believed each statement to be true or false on a nine point categorical scale with end points "certain it is true" and "certain it is false". In reality each of the statements were true and accurate, participants were informed of this once they had considered each of the facts.

Health knowledge.

At the completion of the experiment participant were presented with a knowledge test which tested their health knowledge concerning the health effects of obesity and maintaining healthy weight. The test contained 11 items. For each of the items participants were required to write a response in each of the gaps (e.g., "the life expectancy of an overweight or obese person can be shortened by ______ to ______ years."). The number of responses per item ranged from one to five. The total number of correct responses was participants overall health knowledge (max. score = 22). The correct response for five of the items was presented earlier in the experiment when participants were presented with the health facts. These facts corresponded directly to these five items. The total number of correct responses on these items was operationalised as health information retention (max score. = 13). The remaining six items did not correspond to information presented previously and as such participants relied solely on their pre-existing health knowledge to correctly respond to these items. The total number of correct responses on these items was operationalised as prior knowledge (max. score = 9).

Demographics.

Study participants completed a self-report demographics questionnaire. Participants' age, sex, height and weight were gathered. Body Mass Index (BMI) was calculated using the participants self-reported height and weight using the formula BMI = Weight (kgs)/height (m)^2.

Protection Motivation Theory constructs.

Each of the items measuring the PMT-R constructs were adapted from items which have been utilised in previous fear appeal research (e.g., Cho, 2003; Cho & Salmon, 2006; Witte,1992a, 1994; Witte, n.d.; Witte, et al., 1996) and have demonstrated construct validity (Witte et al., 1996). Items were adapted to fit the health context of the present study. Separate measures of response-efficacy, self-efficacy, costs and intentions were utilised for two separate health behaviours: engaging in regular exercise and adopting/maintaining a healthy diet. The same set of susceptibility and severity items were utilised for both behaviours. Each of the items were measured on a five-item categorical scale grounded by strongly disagree and strongly agree (unless otherwise indicated). Items for each of the constructs were summed and the scores averaged to a mean item score out of five prior to analysis.

Susceptibility. Perceived susceptibility to weight-related health problems was measured using a three-item scale. Participants indicated how "likely", "at risk" and "possible" it is that they would develop weight-related health problems (e.g., "It is likely that I will develop weight-related health problems."). The internal consistency for this measure was acceptable (α = .80).

Severity. Perceived severity of weight-related health problems was measured using a three-item scale. Participants indicated how "severe", "serious" and "harmful" they believed weight-related health problems to be (e.g., "I believe that weight-related health problems have serious negative consequences."). The internal consistency for this measure was high (α = .85).

Response-Efficacy. Response-efficacy was measured using a 3-item scale for both engaging in regular exercise and adopting a healthy diet. Participants indicated the extent to which they agree (i.e., strongly disagree – strongly agree) that engaging in regular exercise (adopting a healthy diet) "works" and "is effective" in preventing weight-related health problems (e.g., "Regular exercise works in preventing weight-related health problems"). The internal consistency for this measure was high for both exercise (α = .87) and maintaining a healthy diet (α = .91).

Self-Efficacy. Self-efficacy was measured using a 3-item scale for both behaviours. Participants indicated to extent to which they believe that they are "able" "can easily do" and "have the skills, time and money" to engage in regular exercise (maintain a healthy diet; e.g., "I am able to engage in regular exercise to prevent the development of weight-related health problems"). The internal consistency for this measure was high for both exercise (α = .87) and maintaining a healthy diet (α = .88).

Costs. Costs were measured using a single negatively scored item: "The benefits of regular exercise outweigh the costs associated with regular exercise (maintaining a healthy diet)".

Intentions.

Intentions to engage in exercise and adopt a healthy diet were measured using a three-item scale. Items included: “I believe I will engage in regular exercise (maintain a healthy diet) to prevent weight-related health problems”, “I am motivated to engage in regular exercise to prevent weight-related health problems” (grounded by “Strongly disagree” and “Strongly agree”) and “How likely is it that you will engage in regular exercise (maintain a healthy and balanced diet)” (grounded by “very unlikely” and “very likely”). The internal consistency of the intentions measure was acceptable (α = .71)

Fear.

Fear was measured using the fear subscale of the Positive and Negative Affect Scale – Expanded Form (Watson & Clark, 1994). This scale has been used extensively in research and the internal consistency and convergent and divergent validity of the fear subscale has been demonstrated (Watson et al.). Individuals responded the extent to which they felt afraid, scared, frightened, nervous, jittery and shaky.

Procedure

Participants completed the experiment in groups of between one and seven. They were presented with a small booklet which contained each of the measures and the threat manipulation. Participants were told that the experiment was investigating the effect of the media on health behaviour. They firstly completed the demographics and past behaviour measures. This was followed by the health information. Following the presentation of the health information participants were informed that all of the statements they read were true. They were then instructed to read the threat message and to complete each of the measures in the order presented. The order of the measures was fear, response-efficacy, self-efficacy, susceptibility, severity, health knowledge and intentions. At the completion of the experiment participants were fully debriefed and informed of the true nature of the project.

Data Analysis

Separate data analyses were conducted for each of the predictions of the study. Where necessary separate analyses were conducted for the two health behaviours under investigation: engaging in regular exercise and maintaining a healthy diet. In order to investigate whether the threat message successfully manipulated perceptions of susceptibility severity and fear, one-way between subjects ANOVAs were conducted on both perceptions of susceptibility, severity and fear. In order to investigate whether the threat manipulation affected participants' recall of the health information a one-way between subjects ANOVA was conducted. A 3 (threat message: moderate, high or no threat) * 2 (prior knowledge: high or low) between subjects ANOVA was utilised to investigate whether prior knowledge moderated the effect of the health message on intentions. For all ANOVAs participants age, sex and BMI were utilised as covariates when significant.

Pearson correlations were utilised to determine whether overall health knowledge is associated with intentions to engage in regular exercise and maintain a healthy diet. Multiple regression was utilised to investigate whether the effect of health knowledge on intentions was mediated by self-efficacy. Hierarchical regression analyses were utilised to investigate whether health knowledge added to the prediction of intentions to exercise and adopt a healthy diet after controlling for the PMT-R predictors. Block 1 contained severity, susceptibility, response- efficacy and self-efficacy; block 2 contained costs. In block 3 health knowledge was added to the PMT-R model.

Results

Confound Checks

Given that the sample included both university students and the general public it was important to ensure that responses did not differ between these groups. A series of independent samples t-tests were conducted on each of the predictor (i.e., severity, susceptibility, response- and self-efficacy, costs, BMI and fear) and outcome variables (health information retention, health knowledge and intentions). No significant differences were found between university students and general public responses on any of these measures (all *t*s(81) < 1.38, all *p*s > .17) – suggesting that there was no systematic difference in how these groups responded.

Manipulation Checks

Analysis of variance revealed a significant main effect of threat manipulation on perceptions of susceptibility ($F(2,78) = 6.17$, $p < 01$, $\eta_p^2 = .14$). Those exposed to the no-threat message had lower perceptions of susceptibility ($M = 1.98$, $SD = .85$) when compared with those exposed to the moderate threat ($M = 2.43$, $SD = .80$) and high threat ($M = 2.65$, $SD = .84$) message. The difference between the moderate and high threat groups was non-significant. No significant main effects of either severity or fear were found (*F*s < .53, n.s.). These findings suggest that the threat messages were mostly unsuccessful in manipulating participants' perceptions of threat. However, the presentation of threatening content (regardless of its intensity) did affect participants' perceptions of susceptibility in the expected direction.

Effect of the Threat Manipulation on Information Retention

Analysis of variance revealed that the main effect of the threat manipulation on health information retention was non-significant ($F(2,80) = .89$, $p = .42$, $\eta_p^2 =.02$). Therefore the prediction that those exposed to the moderate threat message would display the greatest health information retention was not supported.

Effect of Threat Manipulation and Prior Health Knowledge on Behavioural Intentions

Prior to analysis participants were separated into high and low prior knowledge groups using a median split based on their prior knowledge scores. The median score was 4 out of 13, those who scored 4 or below were placed in the low prior knowledge group (n = 52) and those who scored greater than 4 were placed in the high prior knowledge group (n = 31). Those in the low prior knowledge group had a mean prior knowledge score of 3.76 (SD = .47), whereas those in the high prior knowledge group had a mean of 5.21 (SD = .51). The low prior knowledge group was found to have significantly poorer health knowledge when compared with the high prior knowledge group ($t(81) = -13.14$, $p < .001$, $d = 2.91$) suggesting that the artificially created groups indeed differed in their prior health knowledge. Median splits have been used in similar prior research to separate high and low knowledge groups (cf. Challiand et al., 2008; Nabi et al., 2003).

Exercise.

Two-way ANOVA revealed no main effects of either message condition ($F(2,77) = .03$, $p = .97$, $\eta_p^2 = .01$) or health knowledge ($F(1,77) = 2.97$, $p = .09$, $\eta_p^2 =.04$) on intentions to engage in regular exercise. The interaction effect was also non-significant ($F(2,77) = .19$, $p = .83$, $\eta_p^2 < .01$).

Healthy diet.

No main effects of message condition or health knowledge were found for intentions to maintain a healthy diet. The interaction effect was also non-significant. Taken together these findings fail to support the prediction that knowledgeable individuals will have the greatest intentions when presented with a less threatening message, but for those who are less knowledgeable intentions will be greatest when presented with a high-threat message.

Association between Health Knowledge and Intentions

No significant association between health knowledge and either intentions to engage in regular exercise or intentions to maintain a healthy diet were found (see table 4.1). This suggests that contrary to predictions health knowledge had no effect on individuals' intentions to exercise or maintain a healthy diet. Further health knowledge was not associated with self-efficacy suggesting that the effect of health knowledge on intentions is also not mediated by self-efficacy as predicted (cf. Baron & Kenny, 1986).

Hierarchical Regression Analyses Investigating the Predictors of Exercise and Healthy Diet Intentions

Exercise.

As predicted intentions to engage in regular exercise were found to be strongly associated with self-efficacy and costs (negative association), moderate positive associations were also found for severity and response-efficacy. However, contrary to predictions the association between susceptibility and intentions was negative. Hierarchical regression analysis revealed a significant model of intentions to engage in regular exercise which explained 43.93% of its variance ($F(6,76) = 11.71$, $p < .001$, $f^2 = .78$; see table 4.2). Variables in block 1 (severity, susceptibility, response-efficacy and self-efficacy) were found to explain 32.17% of the variance ($F(4,78) = 10.72$, $p < .001$). However, self-efficacy was the only variable to explain unique variance. The addition of costs to the model explained a further 11.51% ($\Delta F(1,77) = 16.93$, $p < .001$). Health knowledge did not add unique variance to the model ($\Delta F(1,76) = 1.35$, $p = .25$).

Table 4.1.

Descriptive Statistics and Correlation Matrix for Exercise (unshaded) and Healthy Diet Intentions (shaded) and All Measured Predictors.

	1	2	3	4	5	6	7
1. Intentions		.33**	-.30**	.52**	.74**	-.58**	.08
2. Severity	.38**		-.15	.55**	.39**	-.43**	-.06
3. Susceptibility	-.24*	-.15		-.25*	-.33**	.19	.04
4. Response-efficacy	.41**	.59**	-.12		.59**	-.54**	.15
5. Self-efficacy	.55**	.40**	-.24*	.47**		-.58**	.06
6. Costs	-.61**	-.49**	.16	-.36**	-.53**		.01
7. Health knowledge	.12	-.06	.09	.09	-.11	.01	

* = $p < .05$; ** = $p < .01$.

Healthy diet.

Intentions to maintain a healthy diet were found to be positively associated with severity, response-efficacy and self-efficacy. As expected, a significant negative association was found between costs and intentions. However, the association between susceptibility and intentions was also negative, not positive as predicted. Hierarchical regression analysis revealed that self-efficacy was the only significant predictor of intentions to maintain a healthy diet from block 1. Taken together, the variables in block 1 explained 53.45% of the variance in intentions ($F(4,78) = 24.53$, $p < .001$). Costs were found to explain a further 2.62% ($\Delta F(1,77) = 5.65$, $p < .05$). However, health knowledge did not explain any further unique variance in intentions ($\Delta F(1,76) = .28$, $p = .60$). The final model explained 55.65% of the variance in intentions to maintain a healthy diet ($F(6,76) = 4.91$, $p < .01$) a large effect size ($f^2 = 1.25$).

Table 4.2.

Results of Hierarchical Regression Analyses Investigating the Prediction of Both Exercise and Healthy Diet Intentions

		Exercise		Healthy Diet	
Predictor		β	R^2_{Adj}	β	R^2_{Adj}
Step 1:	Severity	.13	.32****	-.01	.53****
	Susceptibility	-.10		-.06	
	Response-efficacy	.12		.13	
	Self-efficacy	.42****		.64****	
Step 2:	Severity	-.02	.44****	-.05	.56*
	Susceptibility	-.10		-.06	
	Response-efficacy	.14		.08	
	Self-efficacy	.25*		.56****	
	Costs	-.43****		-.22*	
Step 3:	Severity	-.04	.44	-.04	.56
	Susceptibility	-.10		-.07	
	Response-efficacy	.16		.07	
	Self-efficacy	.22*		.56****	
	Costs	-.44****		-.23*	
	Health knowledge	-.10		.04	

Note. R^2_{Adj} = Adjusted R-squared. * = $p < .05$, ** = $p < .01$, *** = $p < .005$, **** = $p < .001$.

Exploratory Analyses

An anomalous result is the negative relationship between susceptibility and intentions. Intuitively those who perceive themselves to be susceptible to a health problem should be motivated to take action to reduce their risk as predicted by PMT-R (Rogers, 1983). However, researchers have argued that perceptions of susceptibility may be reciprocally related to intentions and behaviour (e.g., Gerrard, Gibbon & Bushman, 1996; Rimal, 2001; Weinstein & Nicolich, 1993). Perceptions of susceptibility may motivate the adoption of protective responses in those who perceive themselves to be at risk (positive association). However, once those protective responses are adopted and maintained individuals perceptions of susceptibility are reduced, resulting in a negative association between susceptibility and protective responses. This suggests that individuals' prior health behaviours may moderate the effect of susceptibility on intentions. Therefore, in order to further investigate the relationship between susceptibility and intentions post hoc analyses were conducted.

Correlations between susceptibility and both past behaviour (i.e., past exercise behaviour, fast food, sugar and soft drink intake) and BMI were calculated. Contrary to predictions, susceptibility was not significantly associated with any of the past health behaviours, suggesting that these factors are unlikely to moderate the effect of susceptibility on intentions. However, susceptibility was positively associated with BMI (r = .38, p < .001). In order to investigate whether BMI moderated the effect of susceptibility on intentions a median split was employed. The low-BMI group had a mean BMI of 20.47 (SD = 2.18) indicating that this group was predominantly of normal weight, whereas the high-BMI group had an average BMI of 26.84 (SD = 4.47) indicating that this group was predominantly overweight/obese. The correlation between susceptibility and intentions for the low-BMI group was weak and non-significant for both intentions to engage in regular exercise (r = -.08, n.s.) and maintain a healthy diet (r = -.18, n.s.). However, moderate negative correlations were found for the high-BMI group for both exercise (r = -.42, p < .005) and healthy diet (r = -.40, p < .005). Contrary to predictions, these findings indicate that those at higher risk of being affected by obesity-related health problems (i.e., those with a high-BMI) were less likely to adopt a protective response when they perceived susceptibility to those health problems. However for those at lower risk, perceived susceptibility had little or no effect on intentions. These findings indicate precisely the opposite of what would be predicted by previous researchers (e.g., Gerrard et al., 1996; Rimal, 2001; Weinstein et al., 1993).

The above finding appears to be counterintuitive, individuals who are at risk and perceive themselves to be at risk should engage in an appropriate protective response. Perhaps those with a high-BMI are not motivated to action by their health risk status; their health risk status may not be salient issue. Another explanation may be that they perceive that the benefits of maintaining their current unhealthy lifestyle negate the effect of the health threat. Alternatively individuals may perceive that the costs of adopting the recommended behaviours outweigh the benefits of adopting those behaviours (cf. Rogers, 1983). Results from table 4.1 suggest no association between susceptibility and costs. However, this effect may be moderated by BMI such that those with a higher BMI have a stronger association between susceptibility and costs, resulting in a stronger negative correlation between perceived susceptibility and intentions. Or more simply costs mediate the effect of susceptibility on intentions for those with high-BMI.

In order to test this prediction the correlations between susceptibility and costs were compared for those with low- and high-BMI. As predicted, the correlations for the low-BMI group were non-significant for both exercise (r = .01, n.s.) and healthy diet (r = .01, n.s.). However, the effects for the high-BMI group were significant for both exercise (r = .33, $p < .05$) and healthy diet (r = .31, $p < .05$). In order to test the mediation hypothesis hierarchical multiple linear regression was utilised. Baron and Kenny (1986) suggest that variables should only entered as potential mediators when a) the predictor (susceptibility) is correlated with the mediator (costs), b) the predictor was correlated with the dependant variable (intentions) and c) the mediator was correlated with the dependant variable. Costs qualified as a potential mediator for both health behaviours so the regression analyses were conducted as planned. Susceptibility was found to be a significant predictor of intentions to engage in regular exercise (β = -.42, p < .005), but was attenuated following the addition of costs to the model (β = -.28, p < .05). However, a Sobel (1982) test of mediation suggested that the indirect effect of susceptibility on intentions was non-significant (Z = -1.77, p = .08). The effect of susceptibility on intentions to maintain a healthy diet was attenuated to non-significance following the addition of costs to the model. However, again the Sobel test suggested that the indirect effect was non-significant (Z = -1.81, p = .07). These findings suggest that the effect of susceptibility on intentions is not mediated by costs for those with high BMI. Rather both susceptibility and costs directly influence intentions.

Discussion

The aim of the present research was to investigate the effect that health knowledge has on individuals' responsiveness to a fear appeal message. The findings suggest that health information retention is not affected by the presentation of a threatening health message. Contrary to predictions, participants' health information retention was similar whether they were exposed to a moderately or highly threatening health message or a message unrelated to health. Type of message also did not affect individual's intentions to engage in regular exercise or maintain a healthy diet. Further, prior health knowledge did not moderate the effect of the health message on intentions as was predicted. Contrary to predictions, overall health knowledge (i.e., health information retention + prior health knowledge) was not associated with either intentions or self-efficacy, and did not contribute unique variance to a model of intentions after controlling for the effects of predictors from PMT-R. Taken together these findings suggest that individual's health knowledge is not affected by the presentation of fear-provoking messages, does not impact on responsiveness to a health message and does not contribute to the prediction of health behaviour intentions.

The finding that the presentation of threatening health message content does not affect health information retention suggests that the use of threatening content does not facilitate or impede one's capacity to retain health message information. The aims of fear appeal campaigns often include the dissemination of health information in order to increase awareness about a specific health problem (e.g., National Binge Drinking Campaign, 2009; National Tobacco Campaign, 2000). However, the results of this study suggest that individuals capacity to retain health information is similar when presented with highly threatening content, milder content or non-threatening content unrelated to health. Therefore, the presentation of health information in a threatening manner may achieve little in the service of the goal of disseminating pertinent health information.

The threat manipulation also had no impact on participants' intentions to engage in regular exercise or maintain a healthy diet. Participants' intentions were similar whether they viewed the highly threatening message, the moderately threatening message or even the message unrelated to health. This suggests that messages designed to elicit fear in respondents (specifically testimonials of those affected by a health issue) fail to motivate protective responses. These results echo previous findings which suggest that threatening messages have no direct impact on protective responses (e.g., Challiand et al., 2008; Maddux et al., 1983; Rogers et al., 1976; Ruiter et al., 2003). However, other findings suggest that manipulations of threat do have a direct effect on persuasive outcomes (e.g., Cho, 2003, Cho et al., 2006; Witte, 1992b). Meta-analytic findings suggest a weak, but significant effect of threat manipulations on intentions in the extant fear appeal literature (Witte & Allen, 2000). Further, the effects were identified to be heterogeneous. Given that the effects were both weak and heterogeneous, the positive meta-analytic finding may be indicative of a trade-off between studies which found that manipulations of threat lead to protective responses and those which do not. Witte and Allen argue that this heterogeneity of findings is unsurprising given that studies often differ in the methodology utilised to manipulate perceptions of threat.

A key difference between the manipulations used in the present study and those of other research is the use of a personal testimonial as the manipulation. Fear appeal research most often employs mock educational materials to manipulate perceptions of threat (e.g., Maddux et al., 1983; Rippetoe & Rogers, 1987; Rogers et al., 1976; Self et al., 1990). Although other research has utilised personal testimonials as part of their manipulations of threat, these have been coupled with a more generalised educational health message detailing the health risks associated with a health problem and imagery depicting the consequences of unhealthy behaviours (e.g., Cho, 2003, 2006; Witte, 1992b; 1994; Witte et al., 1998; Witte & Morrison, 2000). Perhaps personal testimonials are too idiosyncratic to be used to motivate protective action. Participants' may have felt that the symptoms described in the testimonials to be indicative of one individual's experience and do not apply to them. However, manipulation checks suggested that individuals who viewed the obesity related testimonials had higher perceptions of susceptibility than those who viewed the non-health related message. This suggests that individuals perceived the health messages to be at least somewhat relevant to them. However, perceptions of severity and fear were not affected. This suggests that personal testimonials alone may be insufficient to increase perceptions of threat to meaningfully affect individual's motivation to adopt protective responses. Personal testimonials may be more effective if they are coupled with more generalised health information and/or imagery.

Contrary to predictions, the effect of the threat manipulation on intentions was not found to be moderated by prior knowledge. Individuals responded similarly to the threat manipulation message regardless of whether they had high or low prior knowledge. This finding is consistent with Challiand et al. (2008) who found also found no significant interaction (threat * prior knowledge) effect on attitudes towards soft drink intake. Although it was reported that the effect was in the “predicted direction” (pg. 8), it failed to reach conventional levels of significance (i.e., $p < .05$). The results of this study also echo with those of Nabi et al. (2008) who found no main or interaction effects on individual’s intentions to engage in testicular or breast self-examination. However, Nabi et al. did find the predicted interaction effect for attitudes. This suggests that knowledge may be an important moderator of respondents attitudes following exposure to a fear appeal message, but is not so for their behavioural intentions.

A key difference between the methodology employed in the present study and that of previous studies is the use of a health knowledge assessment which minimises any effect of chance responding. The fill in the gaps items utilised in this research required participants to formulate their own response to the questions rather than choosing from a discrete number of response options. This therefore represents a more rigorous assessment of participants’ actual health knowledge as they are far less likely to guess a correct response to an item when they do not have the requisite knowledge to give a correct response. Despite this rigorous measurement, health knowledge was not found to be correlated with intentions to exercise or maintain a healthy diet. This suggests that respondents’ health knowledge has little or no bearing on their probability of adopting protective action. This has some interesting implications for health promotion practice, a tacit assumption of which is that increasing health knowledge will increase health behaviour. Increasing awareness if often an expressed goal of health promotion campaigns (cf. National Binge Drinking Campaign, 2009; National Tobacco Campaign, 2000). However, increases in knowledge are only important outcomes if they translate into desirable changes in attitudes, intentions and behaviour. The results of this study suggest that an individual's health knowledge is not an important predictor of their intentions to engage in regular exercise or maintain a healthy diet.

Contrary to predictions health knowledge also did not impact on perceptions of self-efficacy. This suggests that health knowledge also does not exert an indirect impact on intentions via its impact on self-efficacy. These results fail to support the predictions of the Information-Motivation-Behavioural skills model (Fisher et al., 1992). However, it is noted that while empirical findings suggest a positive association between health knowledge and perceived behavioural skills (similar to self-efficacy), this association is generally weak and has only been observed in other health domains (i.e., AIDS-preventative behaviours: Fisher et al., 1994; breast self-examination: Misovich et al., 2003). In these studies motivation to engage in the behaviour was a much more important predictor of behavioural skills than health knowledge. Although increased health knowledge may be a (relatively weak) predictor of self-efficacy in other health domains, it does not appear to be an important predictor for self-efficacy with respect to diet and exercise.

Perhaps individuals do not need the sort of very specific, concrete health knowledge in order to engage in health protective responses. Health knowledge items in the present study concerned the specific health effects associated with obesity (i.e., the health implications for pregnant women). It may be that individuals only need some vague notion that risky behaviour X is associated with adverse health outcomes, and response Y may reduce their risk. Increased knowledge beyond this very basic understanding may not lead to further motivation to adopt protective behaviour. As most people are likely to have at least a vague understanding that obesity is associated with detrimental health outcomes and exercise and healthy diet can reduce this risk, the retention of more specific information may further not increase intentions to adopt those behaviours. These results may therefore suggest that awareness of a health issue is associated with protective responses up till a point but once this point is reached further education has little or no effect on motivation. Recall of specific health information is often reported as an important outcome measure in health promotion campaign evaluation reports (e.g., National Binge Drinking Campaign, 2009; National Tobacco Campaign, 2000; Wakefield et al., 2003). However, the results of this study may suggest that health promotion professionals need only inform the public that certain health behaviours are bad for their health and what responses are likely to reduce their risk. Increased education beyond that point may not increase behavioural compliance and as such specific health knowledge may not be an important predictor of adaptive responses. Therefore, health promotion efforts may be more fruitful if they focus on other outcomes such as increasing the self-efficacy, especially in cases where the target population has at least a vague knowledge of the health risks and appropriate protective responses (i.e., tobacco smoking, sedentary behaviour, poor diet, alcohol misuse and sun protection).

The results of this study lend some support to the predictions of the PMT-R (Rogers, 1983). The findings that severity, response-efficacy, self-efficacy and costs were each associated with intentions to engage in regular exercise and maintain a healthy diet as predicted the model. However, health knowledge did not explain unique variance in intentions after controlling for the effects of the PMT-R variables. This suggests that health knowledge is not likely to be a necessary or viable addition to PMT-R.

Contrary to predictions, perceptions of susceptibility were negatively associated with intentions. Researchers have noted the inconsistent effects of perceived susceptibility on protective responses in the extant research (e.g., Gerrard et al., 1996; Rimal, 2001; Weinstein & Nicolich, 1993). In many studies a positive association between susceptibility and protective responses has been found (e.g., Plotnikoff, Rhodes, et al., 2009; Weinstein, 1982, 1983; Weinstein, Sandman, & Roberts, 1990), however other studies have found no such effect (e.g., Hodgkins et al., 1998; Plotnikoff, Trinh et al., 2009; Svenson, Fischhoff, & MacGregor, 1985) or a negative association (e.g., van der Velde, Hooijkaas, & Pligt, 1991; Weinstein, Grubb, & Vautier, 1986). Results of the exploratory analyses suggest that the negative association between susceptibility and intentions could not be explained by participants' perceived susceptibility being low due to their current healthy lifestyle (e.g., Gerrard et al., 1996; Rimal, 2001; Weinstein et al., 1993). In fact, those with high-BMI recoded a stronger negative correlation between susceptibility and intentions when compared to those with a low-BMI. That is, those at greater risk were less likely to intend to engage in protective responses when they perceived personal susceptibility. This suggests that fear appeals which attempt to increase at risk individuals' sense of personal susceptibility may be counterproductive as increases in susceptibility may decrease the probability of responding in accordance with the messages recommendations.

A possible explanation for this finding may be that for those with a high-BMI the relationship between susceptibility and costs was found to be significant. This suggests that engaging in regular exercise and adopting a healthy diet is seen as less desirable by these individuals because of the costs they perceive to be involved with adopting these behaviours. Although these individuals accept the health risk, they believe that the costs associated with the protective behaviours outweigh the benefits leading to decreases intentions to adopt the protective behaviours. Although costs were not found to mediate the relationship between susceptibility and intentions, the association between susceptibility and costs suggests that increases in susceptibility may also increase the chances of maladaptive responding via its influence on perceived costs in those at risk. These findings suggest that campaign designers should aim to target interventions at reducing the costs associated with healthy behaviours, rather than highlighting targeted individuals' personal susceptibility.

Another possible interpretation of the negative correlation between susceptibility and intentions may be that susceptible individuals may have perceived the health information and health messages as manipulative or threats to their freedom. By strongly suggesting that the health effects of obesity are severe and associated with many adverse health outcomes individuals may have been perceived as a paternalistic demand to engage in more healthful behaviours. As a result of this perception they may have engaged in reactance, acting against the recommendations as a means of restoring their freedom (cf. Brehm, 1966; Brehm & Brehm, 1981). In support of this view, Ruiter et al (2003) found a positive relationship between threatening health messages targeting breast cancer and perceived manipulation. Reactance has also been observed in response to antismoking messages, especially those which highlight the health risks associated with smoking (Erceg-Hurn et al., 2011; Wolburg, 2006). Unfortunately reactance was not measured in the present study so it is impossible to provide evidence that it could explain the effects found.

Results of the hierarchical regression analysis revealed that only self-efficacy and costs were significant predictors of both intentions to engage in regular exercise and intentions to adopt a healthy diet. Other PMT-R variables (severity, susceptibility and response-efficacy) did not explain unique variance despite significant correlations with intentions. This suggests that the unique variance attributable to these variables was explained by self-efficacy and costs. The findings of the present study suggest that individuals are most likely to intend to engage in protective behaviour when they believe they are capable of adopting the protective behaviour and perceive fewer associated costs. These findings lend support to previous findings which suggests that self-efficacy is the only important PMT-R predictor of health behaviour intentions (e.g., Hodgkins et al.; Plotnikoff et al. 1995; Plotnikoff, Rhodes et al., 2009; Wallace, 2002). Other findings suggest that perceived response-efficacy is an important predictor of intentions as well, but have generally found self-efficacy to be the strongest predictor (e.g., Bui et al., 2013; Plotnikoff, Trinh et al., 2009; Lippke et al., 2009). These findings also support systematic reviews which have presented evidence that self-efficacy is the strongest predictor of intentions within the PMT-R framework (Bui et al.; Floyd et al., 2000; Milne et al., 2000; Plotnikoff et al., 2010). Other models which incorporate self-efficacy such as Social Cognitive Theory (Bandura, 1977a, 1988) and the Theory of Planned Behaviour (Ajzen, 1985, 1987, 1991) are also supported by these findings (cf. Bui et al.). Taken together these findings suggest that the health promotion practitioners should principally aim to increase the target populations' perceptions of self-efficacy with respect to exercise and healthy diet and attempt to eliminate any perceived costs associated with the adoption of these behaviours. Interventions which increase perceptions of threat (i.e., fear appeals) may be ineffective or even counterproductive (cf. Ruiter et al., 2003).

Major Limitations

The results of the present study must be interpreted with consideration of its methodological limitations. The health facts presented to participants contained items which may have been threatening, especially to those at risk of obesity related health problems (e.g., “Obesity is associated with the development of osteoarthritis”). This may have had some impact on participants’ perceptions of threat conflating the effect of the threat manipulation. This may explain why perceptions of fear and severity were unaffected by the threat manipulation, they were already heightened as a result of the presentation of the health information.

A related issue is that the presentation of the health information to be recalled was presented immediately before the presentation of the threat manipulation. Although this methodology was adopted to investigate whether the recall of identical information was affected differently by messages with different levels of threat, fear appeal messages generally present the health information and the threatening content concurrently. As such, the experiment may have failed to adequately emulate the experience of viewing a fear appeal message in naturalistic settings.

A third important limitation of the methodology is that no test of prior knowledge was employed. Individuals health knowledge was assessed only once at the conclusion of the experiment. Therefore, we cannot be sure whether participants recalled the information presented to them earlier or were already aware of this information before entering the experiment. This means that the health information retention measure may have been a conflated measure of individuals’ previous health knowledge and health information they gained from the presentation of the health facts.

A final limitation is that many of the health knowledge items concerned simply general information concerning obesity and obesity prevention (i.e., rates of obesity in Australia) and few were directly related to the behaviours of interest. Fishbein et al. (2010) argued that knowledge relevant to the instrumental and social consequences of engaging in a behaviour may be important for predicting attitudes and intentions but extraneous information may not. Therefore, attempts to predict specific behaviours from general knowledge about a health issue may have been destined to fail (cf. Ajzen & Fishbein, 1977, 1980; Fishbein & Ajzen, 1975, 2010; Fisher et al., 1992).

Minor Limitations

The behaviours of interest in the present study may have been too general. Both behaviours: engaging in regular exercise and maintaining a healthy diet are quite non-specific. How regular is regular exercise? Over what time period do you intend to maintain a healthy diet? It has been argued that prediction of intentions and behaviour is more robust when both the intentions and its predictors are measured at a high level of specificity in terms of the action required, the timeframe over which the behaviour should be performed and the level of specificity of the behaviour (e.g., Fishbein et al., 1975; Ajzen & Fishbein, 1977, 1980). In light of these suggestions items in this study could have been improved if they pertained to "exercising thirty minutes per day five days per week during the next month". A related issue is that the measure of costs was non-specific. We know that individuals who perceived greater costs were less likely to intend to exercise or adopt a healthy diet. However, we do not know which specific costs were salient in the minds of those who perceived high costs associated with these behaviours. Awareness of these perceived costs may be useful as health promotion efforts aimed at removing them may lead to increased uptake of exercise and healthy diet.

A final limitation of the present study was that attitudes were not measured as an outcome variable. Previous studies have found that health knowledge moderates the effect of health messages on attitudes, not intentions (Nabi et al., 2003; Challiand et al., 2008). Several findings suggest that attitudes have a robust effect on health behaviour intentions (e.g., Armitage & Conner, 2001; Godin & Kok, 1996; McEachan et al., 2011). Therefore, although the results of this study are useful in demonstrating that health knowledge does not affect intentions, it is possible it they may have an indirect effect on intentions via a direct effect on attitudes which was undetected in the present study.

Summary

The results of the present study suggest that health information retention and health knowledge may not be important targets for health promotion. Health information retention is unaffected by the presentation of threatening health messages and health knowledge is not associated with intentions to engage in regular exercise or adopt a healthy diet. As such, increasing individuals' knowledge about a health issue beyond a rudimentary lay-understanding is not likely to lead to increased uptake of these behaviours. Further, perceived susceptibility was found to be negatively associated with intentions in the at risk population. As such, interventions which increase perceptions of susceptibility may be counter-productive. Results of this study suggest that health promotion practitioners should focus attention on raising self-efficacy and reducing costs associated with exercise and maintaining a healthy diet. Interventions targeted at increasing perceptions of threat or education may be ineffective or counterproductive for motivating healthy behaviours.

The results of Study 1 suggest that health knowledge is not an important predictor of health behaviour intentions. The only important predictors of intentions were self-efficacy and costs. This suggests that many of the PMT-R variables (i.e., susceptibility, severity and response-efficacy) may not have an independent effect on behaviour after controlling or the effect of self-efficacy. However, it is possible that these variables may indirectly affect behaviour through their influence on variables not included in the PMT-R framework. Further the addition of variables other than health knowledge to the PMT-R may increase its explanatory power (cf. Hagger, 2009). Maddux (1993) argued that perceptions of severity, susceptibility and response-efficacy may contribute to the formation of a positive attitude concerning health protective behaviour. In turn these positive attitudes may then predict intentions and behaviour. Attitudes are a key construct from another approach to the prediction of health behaviour: the reasoned action approach (i.e., the Theories of Reasoned Action [Fishbein & Ajzen, 1975] and Planned Behaviour [TPB; Ajzen, 1985, 1987, 1991]). Maddux proposed a revised form of the Theory of Planned Behaviour which incorporates the predictions of PMT-R. He argued that integrating models of health behaviour in this way is a useful step in reconciling the health behaviour literature and improving on existing models. Study 2 extends the results of the present study by proposing and testing an integrated model which incorporates the predictions of both PMT-R and the TPB.

Chapter 5: Study 2 - Comparing and Integrating the Predictions of Protection Motivation Theory and the Theory of Planned Behaviour in the Context of Smoking

Study 2 was a cross-sectional study conducted in the domain of tobacco smoking. The principle aim of the study was to investigate the predictors of intentions to engage in three behaviours consistent with quitting smoking: making a quit attempt, using nicotine replacement therapy (including patches, lozenges, chewing gum etc.) and avoiding situations where the urge to smoke is increased. Two health behaviour models were utilised to guide the selection of predictors of intentions: the TPB and PMT-R. Accordingly predictors from both models were measured (i.e., TPB: attitudes, subjective norms and PBC; PMT-R: susceptibility, severity, response-efficacy and self-efficacy) in addition to measures of prior smoking behaviour, prior use of nicotine replacement therapy (NRT) products and health knowledge. To date, no research has applied either PMT-R or TPB to the prediction of intentions to use nicotine replacement therapy or intentions to avoid situations where the urge to smoke is increased.

Addressing Limitations from Study 1

A limitation of Study 1 was that the health information presented to participants may have been interpreted as threatening and therefore impacted on their perceptions of threat. In the present study participants completed the health knowledge measure last; after they had completed measures of susceptibility and severity. This means that the information in the health knowledge measure could not impact on individuals' reported susceptibility and severity. Another limitation with the health knowledge measure in Study 1 was that it was unclear whether individuals' recall of the information presented to them early in the experiment represented recall or knowledge they possessed before entering the experiment. The methodology of Study 2 was different and in effect removed this issue. In Study 2 the health knowledge measure was designed to measure just individuals existing health knowledge, not how much information they recalled from a previously presented message. Therefore, participants' scores on the measure should reflect their existing health knowledge alone. The health knowledge items contained in Study 2 focused solely on the health consequences of smoking and methods for quitting smoking. This contrasts with Study 1 where many of the items were related to general health knowledge (i.e., rates of obesity). Focusing on the instrumental consequences of smoking vs. quitting smoking should be more important in predicting attitudes, self-efficacy and intentions than extraneous general health information (cf. Fishbein et al., 2010; Fisher et al., 1992).

Another limitation of Study 1 was that items referred to behaviours which were too general (e.g., "engaging in regular exercise"). To overcome this, in Study 2 items refer to specific behaviours in terms of the action, specificity and timeframe (e.g., "I intend to make an attempt at quitting smoking during the next month"; cf. Fishbein et al., 1975, 2010; Ajzen et al., 1977, 1980). The current study also investigated a number of predictors which were not measured in Study 1. These include: attitudes, injunctive and descriptive norms, perceived controllability and past behaviour. The addition of these predictors allows for a broader, multitheoretical approach to predicting intentions. Investigating these predictors also allows for a comparison between PMT-R and TPB and for an integration of the predictions of these models.

The aims of the present study were threefold. Firstly the study aims to investigate whether TPB and PMT-R are useful models for predicting smoking behaviour intentions. Drawing on the results of Study 1 and other research (e.g., Bui et al., 2013; Lippke et al., 2009; Floyd et al., 2000; Hodgkins et al., 1998; Milne et al., 2000; Plotnikoff et al. 1995; Plotnikoff, Rhodes et al., 2009; Plotnikoff et al., 2010; Plotnikoff, Trinh et al., 2009) it is predicted that self-efficacy will be the strongest predictor of intentions from the PMT-R. This result has also been borne out in at least one study which applied PMT-R to the prediction of intentions to quit smoking

(Maddux et al., 1983). In relation to the TPB it is predicted that both aspects of PBC (self-efficacy and controllability) will be conceptually distinct and each will contribute to the prediction of intentions. It is further predicted that descriptive norms and habit strength (i.e., smoking frequency) will contribute unique variance after controlling for the TPB variables. A second aim of the study is to compare the TPB and PMT-R for their utility in explaining intentions for each of the three behaviours investigated. No research to date has compared the predictions of these models for predicting smoking behaviour intentions. Previous research suggests that each model explains a comparable proportion of the variance in health behaviour intentions (i.e., TPB: 30-51%, PMT-R: 20-56%). However, given that both models have not been compared in the same study it is difficult to predict which (if any) will be the superior model for predicting quit smoking intentions.

Proposed Integrated Model Combining the Predictions of the TPB and PMT-R

A third aim of the present study was to test the predictions of a proposed integrated model combining the predictions of the TPB and PMT-R (see figure 5.1).

Predictions of the Proposed Integrated Model Pertaining to Health Knowledge

Expanding on the findings of Study 1, it is proposed that health knowledge will impact on the individuals' perceptions of susceptibility, severity, response-efficacy and self-efficacy (see figure 5.1). In order to judge whether a health issue is a threat an individual must form an opinion on the basis of their existing health knowledge. By utilising this information individuals can ascertain whether the threat is sufficiently severe to be of concern, and whether they are personally susceptible. Given that the adverse health effects associated with smoking are well established (e.g., AIHW, 2011, 2012; Begg et al., 2007; Scollo & Winstanley, 2012), it is likely that smokers who have greater health knowledge concerning these health threats, will also have higher perceptions of susceptibility and severity.

Similarly in order to judge whether a particular response will be effective in alleviating that threat individuals must have knowledge of the response options available to them and how effective each of these response options are. It is well established that quitting smoking is associated with significant health benefits (e.g., AIHW, 2011, 2012; Ellerman, Ford & Stillman, 2012; US Department of Health and Human Services, 1990, 2004). Therefore, increased health knowledge should be associated with increased perceived response-efficacy for these responses. However, the remaining health behaviours investigated (i.e., use of NRT, avoiding situations where the urge to smoke is increased) are designed to reduce cravings to assist with quit attempts. Therefore the effectiveness of the response must be judged on the basis of its effect on one’s urge to smoke. Nicotine replacement therapy has been shown to assist quit attempts in both effectiveness and efficacy trials (e.g., Cummings & Hyland, 2005; Hughes, Shiffman, Callas & Zhang, 2003; Lancaster, Stead, Silagy & Sowden, 2000; Shiffman, 2007; West & Zhou, 2007). However, despite this effectiveness, it has been estimated that only 17% of smokers use NRT when making a quit attempt (Bansel, Cummings, Hyland & Giovino, 2004; Cummings et al.). A reason for this may be that individuals are misinformed about the health risks associated with NRT and its effectiveness in reducing cravings. Bansel et al. found that many smokers believe that NRT is more dangerous to health than it actually is, and that those who were better informed were more likely to consider NRT when quitting. Etter and Perneger (2001) found that only 16% of smokers surveyed believed that NRT could help them quit smoking. These findings suggest that knowledge deficits may be associated with erroneous beliefs about the efficacy of NRT. As such, more knowledgeable individuals should be more likely to accept that using NRT is effective for reducing nicotine cravings.

Tobacco smoking is not maintained through the physiological dependence alone, often psychological cues can also hamper quit attempts. Smokers may find that they begin to crave a cigarette when they inhale somebody else’s smoke, have a coffee at their favourite coffee shop or when socialising with other smokers. These situations act as cues to smoke as these situations have been repeatedly paired with smoking; as a result nicotine cravings are increased in these situations (cf. Carter & Tiffany, 1999; Ouellette et al., 1998; Payne, Schare, Lewis & Colleti, 1991). As such, repeated exposure to these cues may reduce the chances of a successful quit attempt; conversely avoidance of such cues may assist quit attempts (e.g., Beck, Wright, Newman & Liese, 1993; Peuker & Bizarro, 2014). Possessing this knowledge should inform individual’s perceptions of response-efficacy. Therefore individuals who have greater health knowledge should also have greater perceptions of response-efficacy with respect to use of NRT and avoiding places which induce cravings.

Although the results of Study 1 suggested no relationship between health knowledge and self-efficacy, the lack of effect may have been due to methodological problems with the health knowledge measure. These problems have been addressed in Study 2. Therefore, it is predicted that health knowledge and self-efficacy will be positively correlated (cf. Rimal, 2000), despite no such effect being found in Study 1.

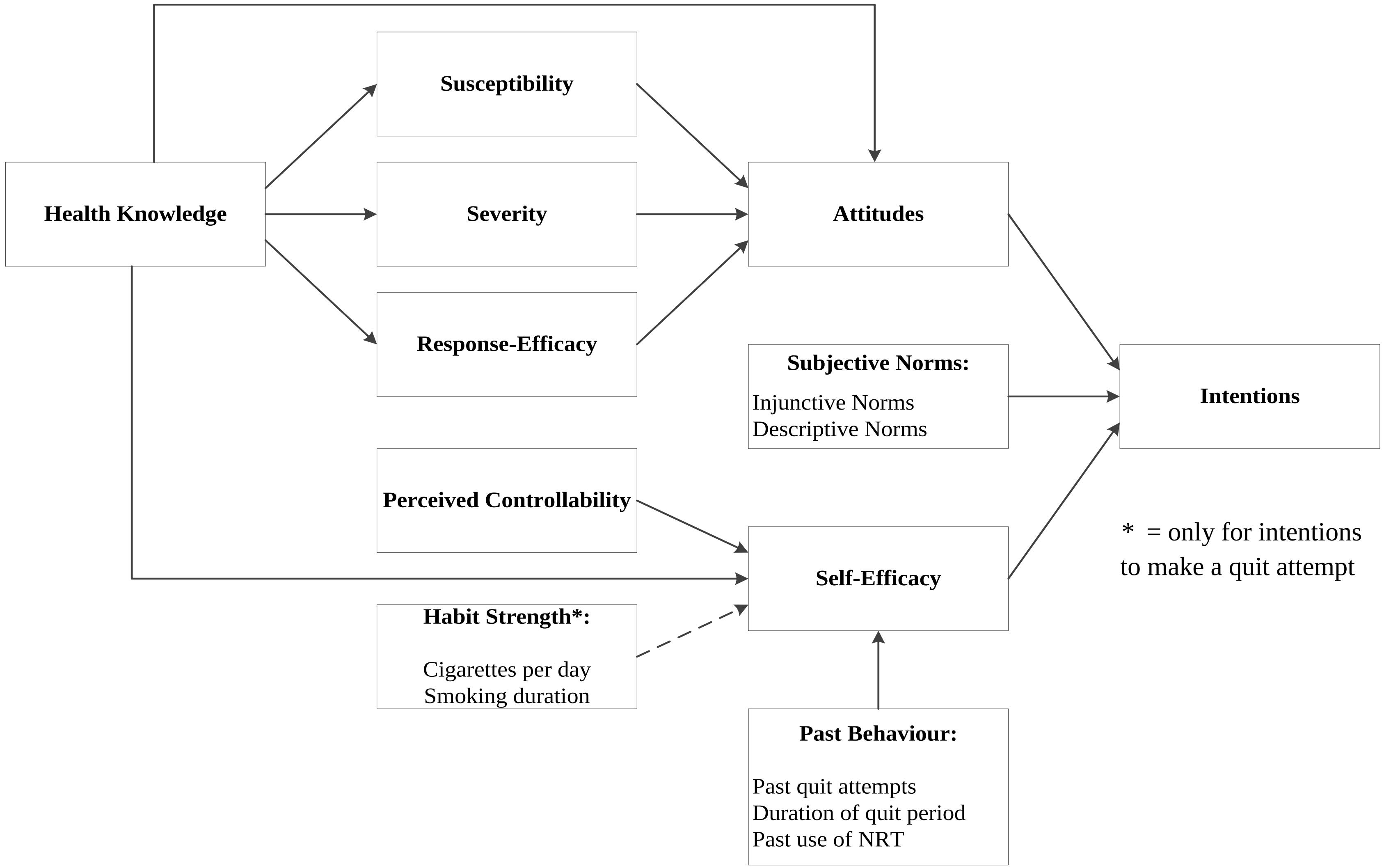

Figure 5.1. Conceptual diagram of the proposed integrated model combining the predictions of the TPB and PMT-R (Study 2).

Predictions of the Proposed Integrated Model Pertaining to the Determinants of Attitudes

Drawing on the suggestions of Maddux (1993), it was predicted that perceptions of susceptibility and severity will contribute to negative attitudes concerning smokers' current smoking behaviour. As such, they should be associated with more positive attitudes towards quitting and behaviours which assist in making a quit attempt. A response which is believed to be associated with reducing one's health risk or assisting in a quit attempt is likely to be perceived as a positive outcome of engaging in that response. In support of this contention Rhodes et al. (2008) found that attitudes were positively correlated. Therefore, response-efficacy should also determine attitudes (see Chapter 2 for a fuller discussion of the relationship between response-efficacy and attitudes).

Predictions of the Proposed Integrated Model Pertaining to the Prediction of Self-Efficacy

Research suggests that individuals who take up smoking earlier in life and who have been smoking for a longer period are less likely to quit (e.g., Chen & Millar, 1998; Ellerman et al., 2012; Hellman, Cummings, Haughey, Zielezny & O'Shea, 1991; Khuder, Dayal & Mutgi, 1999). Also heavier smokers also find it more difficult to quit (e.g., Ellerman et al.; Hyland et al., 2006; Vangeli, Stapleton, Smit, Borland & West, 2011; Zhou et al., 2009). DiClemente (2003) noted that many smokers, especially heavy smokers and those who have smoked for many years; may become resigned to the fact that they are "too far gone" and cannot quit. Such individuals would like to quit, but believe that any attempt will be ultimately unsuccessful – they lack self-efficacy. As such, it is predicted that duration of smoking and number of cigarettes smoked per day will be negatively associated with self-efficacy. Previous quit attempts have been shown to predict future attempts, especially when the period of time that the individual abstained is longer (e.g., Ellerman et al.; Hyland et al.; Zhou et al). Bandura (1977a, 1982) argued that individuals’ perceived self-efficacy with respect to a behaviour may be enhanced by having previously engaged in that behaviour. Therefore, having made a quit attempt previously may increase ones’ self-efficacy concerning their ability to make a successful quit attempt. For similar reasons past use of NRT and past avoidance of situations which often induce nicotine cravings should increase individuals’ self-efficacy to engage in these behaviour in the future.

Perceived controllability was also proposed as a predictor of self-efficacy. It is proposed that in order for an individual to believe that they are capable of engaging in a behaviour, they must first believe they have control over their enactment of that behaviour (see Chapter 2 for a fuller discussion of the relationship between perceived controllability and self-efficacy). Numerous studies have shown that self-efficacy and perceived controllability are positively correlated (e.g., Armitage et al., 1999a, 1999b; Hagger et al.,2002; Hagger et al., 2005; Povey et al., 2000a). However, none have investigated perceived controllability as a predictor of self-efficacy.

Predictions of the Proposed Integrated Model Pertaining to the Prediction of Intentions

Each of the TPB predictors which have each been shown to predict intentions across a variety of health behaviours (e.g., Armitage et al., 2001; Godin et al., 1996; Hagger et al., 2002; McEachan et al., 2011; Notani, 1998; Rivis et al., 2003;

Sandberg et al., 2008; Sheeran et al., 1999; Sheppard et al., 1988). However, descriptive norms have been added to augment the subjective norms construct as it has been shown to increase the explanatory power of the TPB (e.g., Conner & McMillan, 1999; Rivis et al.; Sheeran et al., 1999; White et al., 1994). Further, the PBC construct has been separated into its two constituent parts: self-efficacy and perceived controllability (cf. Garcia et al., 2003; Hagger et al., 2002; Povey et al., 2000a; Terry et al. 1995). The integrated model proposes that self-efficacy will be a direct predictor of intentions but perceived controllability will not (see figure 5.1). The effect of perceived controllability is predicted to be mediated by self-efficacy. This prediction is in line with several findings which suggest that self-efficacy significantly attenuates the effect of perceived controllability on intentions and behaviour (Armitage et al., 1999a, 1999b; Hagger et al., 2002; Hagger et al., 2005; Povey et al., 2000a).

Summarising Predictions of the Proposed Integrated Model

The proposed integrated model adopted several predictions from the TPB and PMT-R, it also made several novel predictions. For ease of reference the specific predictions of the model are summarised here (also see figure 5.1). It is predicted that participants' health knowledge will predict their perceptions of susceptibility, severity and response efficacy. It is predicted that participants' attitudes will be determined by their perceived susceptibility, severity and response-efficacy and their health knowledge. Attitudes are predicted to fully mediate the effects of these variables on intentions. Participants' self-efficacy was predicted to be determined by perceived controllability, habit strength (i.e., cigarettes smoked per day, smoking duration), past behaviour and health knowledge. Self-efficacy was predicted to fully mediate the effect of these predictors on intentions. Finally, intentions were predicted to be determined by individuals' attitudes, injunctive norms, descriptive norms and self-efficacy.

Method

Participants

A total of 91 current smokers were recruited in to the study as participants. However, sixteen participants were removed due to incomplete data leaving a total of 75 participants providing useable data. The mean age of participants was 25.55 (*SD* = 9.38). The mean number of cigarettes smoked per day was 8.74 (*SD* = 7.59) indicating that on average participants were relatively "light" smokers (according to most definitions in the literature, cf. Husten, 2009; Schane, Ling, & Glanz, 2010). Most participants (65.33%) had attempted to quit smoking at least once in the past. The majority of participants were recruited from the undergraduate psychology program of a university in New South Wales, Australia via an online advertisement (*N* = 78), the remaining 13 participants were recruited from the general public via advertisement posters. Undergraduate participants received partial course credit for their participation, whereas the general public participants were placed in the draw to win a small prize at the completion of data collection.

Measures.

Demographics/past behaviour.

Participants each completed a self-report demographics questionnaire. Participants' age, sex and information pertaining to their smoking behaviour was gathered including: how many cigarettes they smoked per day; prior quit attempts (yes/no) and the duration of the most recent quit attempt; and the age at which they began smoking. The duration of their smoking was calculated by subtracting the age they were when they began smoking from their current age. Number of cigarettes smoked per day and duration of smoking were utilised as independent measures of the strength of individuals smoking habit. Whether individuals had previously made quit attempts and the length of time their abstinence were used as measures of past quitting behaviour. Individuals also indicated whether they had previously used NRT products (i.e., patches, lozenges, chewing gum) and whether they previously avoided settings which increased their urge to smoke. These were utilised as measures of past behaviour for intentions to use NRT and intentions to avoid settings which increased their urge to smoke respectively.

Protection Motivation Theory predictors.

Each of the items measuring the PMT-R predictors were adapted from items which have been utilised in previous fear appeal research (e.g., Cho, 2003; Cho et al., 2006; Witte,1992a, 1994; Witte, n.d.; Witte, Cameron, McKeon & Berkowitz, 1996) and have demonstrated convergent and divergent validity (Witte et al., 1996). Items were adapted to fit the health context of the present study. Separate measures of response-efficacy and self-efficacy were utilised for each of the three health behaviours: making a quit attempt, using nicotine replacement therapy (NRT) and avoiding situations where the urge to smoke is increased. The same susceptibility and severity items were utilised all three behaviours. Each of the items was measured on a seven-item categorical scale (grounded by strongly disagree and strongly agree). Items for each of the constructs were summed and the scores averaged to a mean item score out of seven prior to analysis.

Susceptibility. Perceived susceptibility to smoking related health problems was measured using a three-item scale. Participants indicated how “likely”, “at risk" and "possible" it is that they would develop smoking related health problems (e.g., "It is likely that I will develop weight-related health problems."). The internal consistency for this measure was good (α = .91).

Severity. Perceived severity of smoking related health problems was measured using a three-item scale. Participants indicated how "severe", "serious" and "significant" they believed smoking related health problems to be (e.g., "I believe that smoking related health problems are a serious threat to health."). The internal consistency for this measure was very good (α = .97).

Self-Efficacy. Self-efficacy was measured using a 5-item scale for each of the health behaviours. Participants indicated to extent to which they believe that they are capable of quitting smoking (using NRT products, avoiding situations where [they] often feel the urge to smoke; e.g., "I am able to quit smoking during the next month"). The internal consistency for this measure was acceptable for all behaviours measured (αs between .78 and .87).

Response-Efficacy. Response-efficacy was measured for all the health behaviours measured using a 3-item scale. Participants indicated the extent to which they agree (i.e., strongly disagree – strongly agree) that quitting smoking (using NRT products etc.) "works" and "is effective" in preventing weight-related health problems (e.g., "Quitting smoking works in preventing smoking related health problems"). The internal consistency for this measure was acceptable for all health behaviours investigated (αs between .72 and .83).

Theory of Planned Behaviour predictors.

Measures of attitudes, subjective norms and perceived controllability are based on previous research (e.g., Chatsizarantis, Hagger, Smith & Sage, 2006; Hagger, Chatzisarantis & Biddle, 2002a; Fishbein et al., 2010; Hagger et al., 2005; Jones, Sinclair, Rhodes & Coureya, 2004; Kraft, Rise, Sutton & Røysamb, 2005; Payne, Jones & Harris, 2004; Rivis & Sheeran, 2003) and follow guidelines set out by Martin Fishbein and Icek Ajzen (authors of the TRA and TPB; Fishbein et al., 2010) for the creation of items to measure these constructs. Similar measures have been used extensively in the Theory of Planned Behaviour literature and have generally been found to have high reliability (e.g., Chatzisarantis et al.; Hagger et al.; Kraft et al. Payne et al.; Jones et al.; Rivis et al.) and construct validity (e.g., Fishbein et al.; Hagger et al.; Trafimow et al., 2002). Separate measures of attitudes, subjective norms, perceived controllability and intentions were utilised for each of the three health behaviours. With the exception of the attitudes measure, each of the items was measured on a seven-item categorical scale (grounded by strongly disagree and strongly agree). Items for each of the constructs were summed and the scores averaged to a mean item score out of seven prior to analysis. Following prior research, attitudes were measured using a semantic differential scale (cf. Fishbein et al.).

Attitudes. Attitudes towards each of the smoking behaviours were measured using a 4-item semantic-differential scale. Participants indicated the extent to which they believed engaging in each behaviour would be good/bad, pleasant/not pleasant, unwise/wise, beneficial/not beneficial during the next month on a 7-point scale. For most of the behaviours the internal consistency of the scale was good (αs between .80 and .85) However, for quitting smoking the internal consistency was unacceptably low ($\alpha = .59$). Exploratory analysis revealed that the internal consistency of the attitudes measure was increased following the deletion of the pleasant/not pleasant item. As such this item was removed for the analyses pertaining to quitting smoking intentions. The resultant three-item measure had good internal consistency (α = .85).

Normative Influences. Normative influences were measured using a 3-item scale. Two items measured injunctive norms (e.g., "most people who are important to me would recommend that I quit smoking [use nicotine replacement therapy products etc] during the next month"). The final item measured descriptive norms (e.g., "most people who are important to me do not smoke", "most smokers who are important to me use nicotine patches [quit smoking etc.]".). The internal consistency for the overall normative influences measure was unacceptably low for all of the behaviours investigated (αs between .60 and .69). However, when the descriptive norms item was removed from the overall scale internal consistency was acceptable for all behaviours investigated (αs between .71 and .87). This suggests that the injunctive and descriptive norms items may be measuring separate constructs.

Perceived Controllability. Perceived controllability was measured using a 2-item scale. Participants indicated the extent to which they believe they have volitional control over whether they engage in each behaviour during the next month (e.g., "I have control over whether I quit smoking [use nicotine replacement therapy products etc.] during the next month"). Although the internal consistency for this measure was acceptable for using NRT products (α = .76) and avoiding situations where I often feel the urge to smoke (α = .72), internal consistency for quitting smoking (α = .66) did not reach conventional levels of acceptable internal consistency. This scale was still utilised but interpretations of findings pertaining to these scales should be treated with appropriate caution.

Intentions.

Intentions to engage in each of the smoking behaviours were measured using a two-item scale. Items included: “I intend to make an attempt at quitting smoking (use nicotine replacement therapy products etc.) during the next month” and “I will make an attempt at quitting smoking during the next month” (grounded by “Strongly disagree” and “Strongly agree”). The internal consistency of the intentions measure was very good for all behaviours investigated (αs between .97 and .99).

Health knowledge.

The health knowledge measure assessed participants’ knowledge of the health effects associated with smoking, the health benefits of quitting and awareness of various quit aids (i.e., NRT, antidepressants). The test contained 8 items. For each of the items participants were required to write a response in each of the gaps (e.g., “Smoking can cause _______________ complications in women.”; correct response: pregnancy/birth/reproductive). The number of responses per item ranged from one to five. Two health knowledge scales were delineated; threat health knowledge which contained items related to the adverse health effects of smoking (e.g., “What are the health effects of smoking? (please list 5)”); and efficacy health knowledge which contained items related to the health benefits of quitting and the effectiveness of NRT (e.g., “What are some health benefits of quitting smoking? (Please list 3)”). The total number of correct responses on each scale was participants’ health knowledge. The maximum score for the threat knowledge scale was seven and for the efficacy knowledge scale the maximum score was thirteen. Number of correct responses had acceptable internal consistency for both the threat ($\alpha = .70$) and efficacy scales ($\alpha = .82$).

Procedure

Participants completed the experiment online via a website placed on the university server. Participants were told that the experiment was investigating the effect of the media on their health behaviour. They firstly completed the demographics and past behaviour measures. This was followed by measures of susceptibility, severity, response-efficacy, self-efficacy, attitudes, injunctive/descriptive norms and perceived controllability. To limit response bias due to the order of items, these items were presented in random order. Following these items participants were presented with the measures of intentions and health knowledge. At the completion of the experiment participants were fully debriefed and informed of the true nature of the project.

Data Analysis

Principle components analyses with Varimax rotation were utilised to ensure that injunctive and descriptive norms represented distinct constructs. Similar analyses were performed for self-efficacy and perceived controllability. Pearson correlations were utilised to investigate the bivariate effects between predictors and outcome variables. Hierarchical multiple linear regression analyses were utilised to investigate the predictions of PMT-R and the TPB. Akaike Information Criterion (corrected; AICc) values were utilised to compare these models. The corrected value was utilised as it compensates for smaller sample sizes and reduces to AIC as *n* increases (Burnham & Anderson, 2003). Finally, hierarchical and simple multiple regression analyses were utilised to test the predictions of the proposed integrated model. Mediational hypotheses were tested using bootstrapped point estimates (with 95% confidence intervals) for the indirect effects (cf. Preacher & Hayes, 2004, 2008).

Results

Principle Components Analyses

Injunctive and descriptive norms.

Principle components analyses with Varimax rotation were performed on the injunctive and descriptive norms items to ascertain whether they represented separate factors. For each of the behaviours, the injunctive norms items loaded on factor 1 (factor loadings > .50; Kline, 1994; eigenvalues between 1.49 and 1.66; variance explained between 49.69 and 55.54%) and the descriptive norms item loaded on factor 2 (eigenvalues between 1.04 and 1.20; variance explained between 34.72 and 39.98%). The two factor solutions explained between 85.98% and 90.22% of the variance. These findings suggest that injunctive and descriptive norms are distinct constructs. Therefore, injunctive and descriptive norms were treated as separate constructs for analysis.

Self-efficacy and perceived controllability.

Principle components analysis (with Varimax rotation) were performed on the self-efficacy and perceived controllability items to determine whether they represent distinct constructs. For each of the smoking behaviours investigated, the five self-efficacy items loaded on factor 1 (eigenvalues between 2.40 and 3.24; variance explained between 40.15 and 46.32%) and the two perceived quality items loaded on factor 2 (eigenvalues between 1.45 and 2.04; additional variance explained between 24.74 and 29.08%). The two factor solutions explained between 64.38 and 71.06% of the variance. As such, self-efficacy and perceived controllability were treated as separate constructs for analysis.

Correlations between Predictor and Outcome Variables.

Make a quit attempt.

Intentions to make a quit attempt during the next month were found to be positively associated with injunctive norms, self-efficacy, perceived controllability, severity, response efficacy and previous quit attempts (see table 5.1). As expected, a negative correlation between duration of smoking and intentions was also found. However contrary to expectations, individuals attitudes, cigarettes smoked per day, length of quit attempt and age at which smoking began were not associated with intentions. Self-efficacy was found to be negatively associated with number of cigarettes smoked per day, but was not correlated with any other past behaviours. Self-efficacy was also correlated with perceived controllability. Attitudes was associated with perceived severity and response-efficacy but was uncorrelated with perceive susceptibility. Contrary to predictions health knowledge was uncorrelated with severity, susceptibility, response-efficacy, self-efficacy and attitudes.

Use nicotine replacement therapy.

Both attitudes and descriptive norms recorded strong positive associations with intentions to use NRT during the next month (see table 5.2). Moderate positive associations were found for self- and response-efficacy, injunctive norms and previous use of nicotine patches. Contrary to predictions, a negative association was found between threat health knowledge and intentions to use NRT. Self-efficacy was found to be associated with perceived controllability and prior use of nicotine patches and nicotine gum. Attitudes were found to be associated with response-efficacy, but not perceived susceptibility and severity. Contrary to predictions health knowledge was not associated with susceptibility, severity and response-efficacy and threat health knowledge was negatively associated with self-efficacy.

Avoid situations where I often feel the urge to smoke.

Intentions to avoid situations which induce cravings were strongly associated with attitudes. Weak positive associations were recorded for descriptive norms, susceptibility and response-efficacy. Contrary to expectations, a moderate negative correlation was recorded between threat health knowledge and intentions. Self-efficacy was found to be positively associated with perceived controllability but not with prior avoidance behaviour. Attitudes was positively associated with response-efficacy but not perceived susceptibility or severity. Contrary to predictions health knowledge was not correlated with attitudes, susceptibility, severity, response- or self-efficacy (see table 5.3).

Applying Protection Motivation Theory to the Prediction of Intentions to Make a Quit Attempt, Use Nicotine Replacement Therapy Products and Participants' Avoidance of Situations where they often feel the Urge to Smoke

Hierarchical regression analyses were utilised to test the predictions of PMT-R. These analyses (described below) were structured similarly for each of the three health behaviours investigated. Block 1 contained each of the PMT-R predictors (i.e., severity, susceptibility, self- and response-efficacy). Block 2 consisted both threat and efficacy health knowledge and block 3 contained past behaviour. The predictors in blocks 1 and 2 were identical for each of the health behaviours however they differed for block 3. For intentions to make a quit attempt block 3

Table 5.1

Correlation Matrix for Quit Smoking Intentions and all Measured Predictors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Intentions														
2. Attitudes	.20													
3. Injunctive norms	.37**	.36**												
4. Self-efficacy	.53**	.09	.11											
5. Perceived controllability	.33**	.32**	.32**	.43**										
6. Descriptive norms	.11	.16	.28*	.27*	.01									
7. Susceptibility	.04	.18	.41**	-.11	.18	.01								
8. Severity	.29*	.36**	.40**	.16	.38**	.05	.43**							
9. Response-efficacy	.27*	.38**	.54**	.10	.49**	.21	.19	.36**						
10. Quit attempt (yes/no)	.29*	.00	.12	.11	.20	-.23*	.20	.17	.13					
11. Longest quit attempt	.20	.02	.09	.09	.22	-.20	.03	.02	.11	.41**				
12. Cigarettes smoked/day	-.11	-.06	.22	-.29*	.04	-.10	.40**	.10	.07	.26*	.06			
13. Smoking duration	-.23*	.10	.12	-.19	.01	-.16	.12	.08	.10	.28*	.32**	.27*		
14. Threat HK	-.19	.02	-.23*	-.03	-.04	-.10	-.01	-.02	-.18	-.01	-.06	-.02	.20	
15. Efficacy HK	-.13	.00	-.19	.13	-.16	.05	-.02	-.17	-.13	.00	-.06	-.12	.09	.55**

Note: HK = health knowledge. * = $p < .05$; ** = $p < .01$.

Table 5.2

Correlation Matrix for Intentions to use Nicotine Replacement Therapy and all Measured Predictors

	1	2	3	4	5	6	7	8	9	10	11	12
1. Intentions												
2. Attitudes	.58**											
3. Injunctive norms	.37**	.54**										
4. Self-efficacy	.44**	.61**	.50**									
5. Perceived controllability	-.01	.20	.42**	.47**								
6. Descriptive norms	.64**	.39**	.33**	.40**	.02							
7. Susceptibility	.16	.09	.26*	.07	.14	-.01						
8. Severity	.04	.22	.31**	.26*	.35**	-.04	.43**					
9. Response-efficacy	.41**	.45**	.48**	.45**	.21	.44**	.16	.31**				
10. Nicotine patches	.33**	.24*	.13	.23*	.05	.06	.19	.06	.16			
11. Nicotine gum/lozenges	.00	.11	.05	.23*	.11	-.06	.13	.13	.02	.44**		
12. Threat HK	-.37**	-.21	-.19	-.25*	-.08	-.07	-.01	-.02	.03	-.09	-.03	
13. Efficacy HK	-.20	-.09	-.06	-.09	-.16	.05	-.02	-.17	.10	-.09	.02	.55**

Note: HK = health knowledge. * = $p < .05$; ** = $p < .01$.

Table 5.3

Correlation Matrix for Participants' Intentions to Avoid Situations where they often feel the urge to Smoke and all Measured Predictors

	1	2	3	4	5	6	7	8	9	10	11
1. Intentions											
2. Attitudes	.53**										
3. Injunctive norms	.18	.00									
4. Self-efficacy	.15	.24*	.26*								
5. Perceived controllability	.10	.10	.37**	.55**							
6. Descriptive norms	.30**	.17	.27*	.33**	.27*						
7. Susceptibility	.23*	.18	.07	-.09	.02	-.09					
8. Severity	.00	.20	.06	.20	.29*	-.02	.43**				
9. Response-efficacy	.26*	.34**	.34**	.48**	.37**	.21	.21	.49**			
10. Past avoidance	-.08	-.17*	.05	-.06	-.11	-.03	.10	-.05	-.18		
11. Threat HK	-.33**	-.14	.04	.01	-.20	.06	-.01	-.02	.03	.06	
12. Efficacy HK	-.14	.13	.07	.03	-.12	.00	-.02	-.17	.05	-.18	.55**

Note: HK = health knowledge. * = $p < .05$; ** = $p < .01$.

contained cigarettes smoked per day, whether a quit attempt had been made in the past (dummy variable 1 – yes, 0 = no), length of most recent quit attempt (in days) and duration of smoking. For the remaining three health behaviours block 3 contained prior nicotine patch use (dummy variable 1 – yes, 0 = no), prior nicotine lozenge/chewing gum use (dummy variable 1 – yes, 0 = no) and prior avoidance behaviour (dummy variable 1 – yes, 0 = no) only. Previous research investigating PMT-R have generally found medium to large effect sizes (f^2s between .25 and 1.27; e.g., Bui et al., 2013; Hodgkins et al., 1998; Maddux et al., 1983; Melamed et al., 1996; Plotnikoff et al., 1995, 1998, 2002; Plotnikoff, Trinh, et al., 2009; Rogers et al., 1976; Stanley et al., 1986; Van der Velde, et al., 1991). Power to find a small-medium effect size (f^2 = .15) exceeded .90 for all analyses indicating that power was not an issue for these analyses.

Make a quit attempt.

Hierarchical regression analysis revealed that the PMT-R predictors collectively explained 31.22% of the variance in intentions to make a quit attempt during the next month ($F(4,70) = 9.40$, $p < .001$, *AICc* = 84.92; see table 5.4). However, self-efficacy was the only significant predictor. Health knowledge ($\Delta F(2,68) = 1.52$, $p = .23$, *AICc* = 86.31) did not contribute to the prediction of intentions ($\Delta F(2,68) = 1.52$, $p = .23$, *AICc* = 86.31). The prior behaviour variables explained a further 7.23% of the variance in intentions ($\Delta F(4,64) = 3.03$, $p < .05$, *AICc* = 83.51). Both the prior quit attempts dummy variable ($\beta = .23$, $p < .05$) and duration of smoking ($\beta = -.27$, $p < .05$) emerged as significant predictors. The final model explained 39.46% of the variance in intentions ($F(10,64) = 5.82$, $p < .001$) a large effect size ($f^2 = .65$).

Use nicotine replacement therapy.

Protection Motivation Theory predictors were found to explain 25.59% of the variance in intentions to use nicotine replacement therapy products during the next month ($F(4,70) = 7.36$, $p < .001$, *AICc* = 68.69). However, only response-efficacy and self-efficacy emerged as significant predictors. Threat and efficacy health knowledge added a further 8.48% ($\Delta F(2,68) = 5.05$, $p < .005$, *AICc* = 61.43). The past behaviour variables (i.e., past use of nicotine patches and past use of other nicotine replacement products [i.e., lozenges, chewing gum etc.]) explained a further 4.29% of the variance in intentions to use NRT ($\Delta F(2,66) = 3.37$, $p < .05$, *AICc* = 58.15). The final model explained 38.36% of the variance in intentions ($F(8,66) = 6.76$, $p < .001$, $f^2 = .62$).

Avoid situations where I often feel the urge to smoke.

Hierarchical regression analysis revealed that the PMT-R predictors explained 10.66% of the variance in participants intentions to avoid situations where they often feel the urge to smoke during the next month ($F(4,70) = 3.21$, $p < .05$, *AICc* = 114.54). Severity, susceptibility and response-efficacy were significant predictors but contrary to predictions self-efficacy was not. Threat and efficacy health knowledge were found to explain a further 9.96% of the variance in intentions ($\Delta F(2,68) = 5.39$, $p < .01$, *AICc* = 108.16). Prior avoidant behaviour did not contribute unique variance to the regression model ($\Delta F(1.67) = .25$, $p = .62$, *AIC* = 112.10). The final model explained 19.73% of the variance in intentions ($F(5,69) = 3.60$, $p < .005$) a medium effect size ($f^2 = .25$).

Bivariate correlations between severity and intentions were small and non-significant ($r = .002$). This suggests that severity may have acted as a suppressor variable increasing the predictive validity of other variables in the regression equation.

Table 5.4

Results of Hierarchical Regression Analyses Investigating the Predictions of PMT-R for all Three Health Behaviours Investigated

	Quit Smoking		Use NRT		Avoid Situations	
Predictor	*β*	R^2_{Adj}	*β*	R^2_{Adj}	*β*	R^2_{Adj}
Step 1: Susceptibility	.00	.31****	.19	.26****	.30*	.11*
Severity	.15		-.22		-.29*	
Response-efficacy	.17		.29*		.29*	
Self-efficacy	.49****		.36***		.09	
Step 2: Susceptibility	.01	.32	.19	.34**	.30*	.21**
Severity	.13		-.24*		-.31*	
Response-efficacy	.15		.36***		.31*	
Self-efficacy	.51****		.26*		.09	
Threat HK	-.09		-.26*		-.33*	
Efficacy HK	-.10		-.11		-.02	
Step 3: Susceptibility	-.02	.39*	.15	.38*	.31*	.20
Severity	.14		-.19		-.31*	
Response-efficacy	.15		.31**		.30*	
Self-efficacy	.42****		.25*		.09	
Threat HK	-.04		-.26*		-.31*	
Efficacy HK	-.09		-.06		-.04	
Past behaviour$_1$:						
Quit attempt	.23*					
Quit duration	.12					
Nicotine patches			.26*			
Other NRT			-.18			
Avoid					-.06	
Habit strength$_2$:						
Cigarettes/day	-.01					
Smoking duration	-.27*					

Note. $_1$ = multiple measures of past behaviour, $_2$ = multiple measures of habit strength, HK = health knowledge, NRT = nicotine replacement therapy * = $p < .05$, ** = $p < .01$, *** = $p < .005$, **** = $p < .001$.

Suppressor variables generally increase the prediction of an outcome variable of interest by increasing the predictive validity of one or more predictor variables (cf. MacKinnon, Krull & Lockwood, 2000; Pandey & Elliot, 2010; Tzelgov & Henik, 1991). This occurs as the suppressor variable is associated with other predictors in the regression model and suppresses variance in one or more of the predictor variables which is irrelevant to the outcome variable. Given that severity is positively associated with perceived susceptibility (but not self-efficacy) it is likely that the addition of severity in the model served to increase the predictive validity of susceptibility by suppressing its irrelevant variance (i.e., classical suppression; cf. Pandey & Elliot, 2010; Tzelgov & Henik, 1991).

Tests of suppression/mediation. MacKinnon et al. (2000) demonstrated that suppression and mediation are mathematically equivalent. As such, tests of mediation (such as the Sobel [1982] test) can also be applied to identifying suppression effects (Preacher & Hayes, 2004, 2008). Essentially the Sobel test determines whether the indirect effect of a predictor (i.e., the total effect of the predictor on the outcome variable minus its effect after controlling for another variable) is different from zero (regardless of the direction of that change). In the case of mediation (where the Sobel test is more commonly used) the regression coefficient for the predictor is reduced after the mediator is entered into the model. In contrast, in suppression the regression coefficient of the predictor is increased after the suppressor variable is entered into the model. However, the Sobel test has low statistical power and is most appropriate for use with large sample sizes. MacKinnon, Lockwood, Lockwood, West and Sheets (2002) suggest that at least a sample size of at least 100 is needed to detect a medium effect size with the Sobel test (the sample size in the present study is 75).

In contrast the bootstrapping method advocated by Preacher et al. (2004) is non-parametric, so therefore more appropriate with smaller sample sizes. Preacher et al.'s method produces bootstrapped point estimates for the indirect effect and confidence intervals which can be used to determine the significance of the indirect effect. If a 95% confidence interval for the point estimate does not contain zero, it can be inferred that a significant mediation or suppression effect is present (depending on the direction of the change in the regression coefficient of the predictor, Preacher et al., 2004, 2008).

Preacher and Hayes (2008) and Hayes and Preacher (in press) developed more versatile methods, again using bootstrapping, which allowed users to investigate models with multiple mediators, multiple predictors and control for the effects of other variables in a complex regression model containing three or more predictors. Therefore, to control for the effects of other variables in the model the Preacher and Hayes (2008) method was utilised to investigate all suppression and mediation effects in Study 2.

Severity was moderately correlated with susceptibility, and the β-value for susceptibility in the regression equation prediction intentions to avoid situations where the urge to smoke is increased was larger than its bivariate relationship with intentions. Therefore, severity may have suppressed irrelevant variance in susceptibility. The Preacher et al. (2008) method was utilised to test whether severity acted as a suppressor variable in the regression equation. Controlling for other variables in the model, severity was found to be a suppressor variable for susceptibility (M = -.15, SE = .08, 95% C.I. = -.39 – -.05). This indicates that intentions were uncorrelated with the shared variance between susceptibility and severity.

Applying the Theory of Planned Behaviour to the Prediction of Intentions to Make a Quit Attempt, Use Nicotine Replacement Therapy Products and Participants' Avoidance of Situations where they often feel the Urge to Smoke

Similar to the PMT-R analyses, hierarchical regression analyses were utilised to test the predictions of the TPB. The structure of the analyses was similar for each of the health behaviours investigated in that block 1 contained the TRA variables (i.e., attitudes and injunctive norms), block 2 contained the remaining TPB variables (self-efficacy and perceived controllability) and block 3 contained descriptive norms. Blocks 4 contained threat and efficacy health knowledge and block 5 contained prior health behaviour. Power to find a small-medium effect size (f^2 = .15) exceeded .90 for all analyses.

Make a quit attempt.

Hierarchical regression revealed that the TRA variables collectively explained 13.15% of the variance in intentions to make a quit attempt during the next month (F(2,72) = 6.60, p < .005, *AICc* = 100.13; see table 5.5). However, only injunctive norms were a significant predictor. The addition of self-efficacy and perceived controllability to the model added a further 21.59% (ΔF(2,70) = 12.91, p < .001, *AICc* = 80.99). Self-efficacy was a significant predictor of intentions but perceived controllability was not. The addition of both descriptive norms (ΔF(1,69) = 1.79, p = .19, *AICc* = 81.37) and health knowledge (ΔF(2,67) = 1.14, p = .33, *AIC* = 83.66) did not add significant variance to the model. The prior behaviour variables explained a further 8.84% of the variance in intentions (ΔF(4,63) = 3.67, p < .01, *AIC* = 78.46). However, only the prior quit attempts dummy variable (β = .26, p < .05) and duration of smoking (β = -.30, p < .005) emerged as significant predictors. The final model explained 44.57% of the variance in intentions (F(11,63) = 6.41, p < .001, f^2 = .80).

Use nicotine replacement therapy.

Hierarchical regression revealed a significant model of intentions to use NRT during the next month (F(9,65) = 14.41, p < .001, R^2_{Adj} = .62 f^2 = 1.63). Attitudes and injunctive norms explained 31.67% of the variance in intentions (F(2,72) = 18.15, p < .001, *AICc* = 60.40). However, only attitudes were a significant predictor. Self-efficacy and perceived controllability together explained a further 4.15% (ΔF(2,70) = 3.33, p < .05, *AICc* = 57.59). Nevertheless, self-efficacy was not a significant predictor and perceived

Table 5.5

Results of Hierarchical Regression Analyses Investigating the Predictions of the TPB for all Three Health Behaviours Investigated

	Quit Smoking		Use NRT		Avoid situations	
Predictor	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}
Step 1: Attitudes	.13	.13***	.53****	.32****	.53****	.30****
Injunctive norms	.35***		.08		.18	
Step 2: Attitudes	.01	.35****	.40***	.36*	.54****	.28
Injunctive norms	.31***		.14		.20	
Perceived control	.02		-.26*		-.02	
Self-efficacy	.49****		.25		-.03	
Step 3: Attitudes	.02	.36	.34***	.51****	.52****	.30
Injunctive norms	.32***		.05		.16	
Perceived control	-.04		-.15		-.03	
Self-efficacy	.55****		.10		-.07	
Descriptive norms	-.14		.45****		.20	
Step 4: Attitudes	.04	.36	.32***	.57***	.49****	.38**
Injunctive norms	.32***		.03		.20	
Perceived control	-.04		-.15		-.14	
Self-efficacy	.55****		.05		-.01	
Descriptive norms	-.14		.47****		.22*	
Threat HK	-.06		-.20*		-.26*	
Efficacy HK	-.11		-.11		-.09	
Step 5: Attitudes	.09	.45**	.28**	.62**	.49****	.37
Injunctive norms	.35***		.02		.20	
Perceived control	-.08		-.13		-.14	
Self-efficacy	.44****		.04		-.01	
Descriptive norms	-.09		.47****		.22*	
Threat HK	.01		-.21		-.25*	
Efficacy HK	-.11		-.07		-.10	
Past behaviour$_1$:						
Quit attempt	.26*					
Quit duration	.12					
Nicotine patches			.26***			
Other NRT			-.12			
Avoid					-.02	
Habit strength$_2$:						
Cigarettes/day	-.06					
Smoking duration	-.30***					

Note. $_1$ = multiple measures of past behaviour, $_2$ = multiple measures of habit strength, HK = health knowledge, Perceived control = perceived controllability, NRT = nicotine replacement therapy * = p < .05, ** = p <.01, *** = p <.005, **** = p < .001.

controllability was negatively associated with intentions. Descriptive norms explained a further 15.38% ($\Delta F(1,69) = 23.06$, $p < .001$, $AICc = 37.96$). The effect of perceived controllability on intentions was attenuated to non-significance following the addition of descriptive norms to the model. Threat and efficacy health knowledge explained a further 6.24% ($\Delta F(2,67) = 6.06$, $p < .005$, $AICc = 29.50$). Consequently, only threat health knowledge was found to be a significant predictor, registering a negative β-value. Finally, the prior use of nicotine patches and other NRT products dummy variables were found to explain an additional 4.66% ($\Delta F(2,65) = 5.02$, $p < .01$, $AICc = 22.74$).

Avoid situations where I often feel the urge to smoke.

Hierarchical regression analyses revealed a significant model which explained 37.19% of the variance in participants' intentions to avoid situations where they often feel the urge to smoke ($F(8,66) = 6.48$, $p < .001$, $f^2 = .59$). Attitudes and injunctive norms were found to explain 29.51% of the variance in intentions ($F(2,72) = 16.49$, $p < .001$, $AICc = 94.48$). However, only attitudes were a significant predictor. The addition of self-efficacy and perceived controllability to the model did not contribute significant unique variance ($\Delta F(2,70) = .07$, $p = .94$, $AICc = 98.74$). Descriptive norms also did not contribute to the model ($\Delta F(1,69) = 3.39$, $p = .07$, $AICc = 97.44$). Threat and efficacy health knowledge explained a further 8.07% of the variance in intentions ($\Delta F(2,67) = 5.50$, $p < .01$, $AICc = 90.84$). Prior avoidance behaviour did not contribute significant unique variance to the model ($\Delta F(1,66) = .04$, $p = .85$, $AIC = 93.31$).

Comparison between PMT-R and TPB Models of Intentions to Make a Quit Attempt, Use Nicotine Replacement Therapy Products and Participants' Avoidance of Situations where they often feel the Urge to Smoke

Akaike Information Criterion.

Akaike information criterion (corrected) values were calculated for each of the regression models and utilised to determine the relative strength of each of these models. Individual AICc values may be used for comparing one model to another and are thus useful for selecting one model from a candidate set of plausible models. Model selection statistics such as AICc can be used to estimate the relative strength of each candidate model. As such, these values can be applied when researchers have multiple working hypotheses (i.e., a number of plausible explanations for a phenomenon are being tested and compared; cf. Burnham et al., 2004; Chamberlin, [1890], 1965) rather than a single hypothesis and a null hypothesis. The purpose of this research is to compare the relative strength of PMT-R and TPB for explaining health behaviour intentions. Therefore, the use of AICc values suits our needs well.

Akaike information criterion values may be used to compare models for their relative goodness of fit to the data; they are preferable to R^2 values for a number of reasons. The AICc values punish overcomplexity of models, and will therefore tend to select the most parsimonious model which explains the data. This contrasts with R^2 which increase as more variables are added and does not punish over-fitting to the data. Further, R^2 values may be affected by the order in which variables are entered into a regression equation, AICc values remain consistent regardless of the ordering of models. However most importantly, AICc values can be utilised to compare non-nested models which is impossible using R^2 and ΔR^2 values (Burnham & Anderson, 2002; Mazerolle, 2006).

Individual AICc values give little indication of the absolute quality or goodness of fit of a particular model. The AICc values themselves represent the amount of information lost when a model is used to explain a particular variable (cf. Burnham et al., 2002, 2004; Mazerolle, 2006). As such, lower AIC values represent less information loss and better model fit to the data. However, individual AICc values are not interpretable as they are much affected by sample size (cf. Burnham et al., 2004); essentially the greater the sample size, the greater the amount of information and the greater the potential for loss of information through the application of a model to explain the data. Burnham et al., (2004) reported witnessing AIC values between -600 and 340,000.

We can compare AICc values for individual models in order to ascertain which does the best job at approximating the relevant data, and if there is evidence that one model should be preferred over another. In order to do this we need to calculate the difference between a candidate model (*i*) and the model with the minimum AICc value from a candidate set (Δ_i). The larger the Δ_i the less likely it is that *i* is the best approximating model (Burnham et al., 2004). Models with an $\Delta_i < 2$ may be seen as essentially equivalent to the model with the minimum AICc; models in which $4 < \Delta_i < 7$ have considerably less support and are most likely a poorer approximating model than the model with the lowest AICc; and models with $\Delta_i > 10$ are almost definitely a poorer approximating model than the model with the minimum AIC (Burnham et al., 2004). The formula $\exp(-\Delta_i /2)$ gives the probability that *i* is actually the best approximating model relative to the model with the minimum AIC (Burnham et al., 2002). When $\Delta_i >$ 10 the relative probability that model *i* is the best approximating model is < .01. AICc values can also be utilised to determine Akaike weights (w_i) for each model. Akaike weights can be interpreted as the probability that a candidate model is the best model (minimises information loss) among a set of candidate models for explaining the data (Wagenmakers & Farrell, 2004). Therefore, a model with a w_i of .60 is 60% likely to be the best model in a candidate set. The strength of evidence of one model over another can be obtained by dividing their respective Akaike weights (Wagenmakers et al.). If Model A has a w_i of .60 and Model B has a w_i of .20, Model A is 3 times as likely to be the best approximating in the candidate set when compared with Model B (i.e., 60/20 = 3).

Akaike information criterion values were utilised to compare eight separate models of intentions for each of the health behaviours investigated. The eight models were: 1) PMT-R (i.e., susceptibility, severity, response- and self-efficacy); 2) PMT-R plus health knowledge; 3) Model 2 plus prior behaviour; 4) TRA (attitudes and injunctive norms); 5) TPB (i.e., TRA plus self-efficacy and perceived controllability); 6) Model 5 plus descriptive norms; 7) Model 6 plus health knowledge; 8) Model 7 plus prior behaviour. The strength of evidence for the TPB (Model 5) over PMT-R (Model 1) was calculated to highlight which of the two was the better approximating model.

Make a quit attempt.

The model with the lowest AICc value for intentions to make a quit attempt was model 8 (TPB + descriptive norms + health knowledge + past use of nicotine patches; see table 5.6). Model 8 was clearly superior to model 4 (TRA; $\Delta_i > 15$) and had considerably greater support than models 2, 3 and 7 ($\Delta_i > 5$). Models 5 (w_i = .16) and 6 (w_i = .13) were also relatively strong models in the candidate set but were less likely than model 8 (w_i = .58). This indicates that the addition of past behaviour variables may be used to augment the TPB for predicting intentions to make a quit attempt. The ratio of the Akaike weights for model 5 (TPB) and model 1 (PMT) was 7.14, indicating that the TPB was 7.14 times as likely to be the better approximating model. This suggests that the TPB is most likely the best are most parsimonious model for explaining intentions to make a quit attempt.

Table 5.6

Results of AICc Analysis for Competing Models of Intentions to make a Quit Attempt, use Nicotine Replacement Therapy and Participants' Intentions to Avoid Situations where they Often Feel the Urge to Smoke

Health Behaviour	Model No.	k_i	$AICc_i$	Δ_i	w_i	TPB:PMT
Quit attempt	1	4	84.92	6.47	.02	7.14
	2	6	86.31	7.85	.01	
	3	10	89.84	5.05	.04	
	4	2	100.13	21.67	<.001	
	5	4	80.99	2.54	.16	
	6	5	81.97	2.91	.13	
	7	7	83.65	5.20	.04	
	8	11	87.33	.00	.58	
Nicotine replacement therapy	1	4	68.69	43.75	<.001	257.24
	2	6	61.43	37.16	<.001	
	3	8	58.15	34.82	<.001	
	4	2	60.40	35.06	<.001	
	5	4	57.59	32.65	<.001	
	6	5	37.96	13.32	.001	
	7	7	29.50	5.66	.06	
	8	9	22.74	.00	.94	
Avoidance	1	4	114.54	23.70	<.001	2697.28
	2	6	108.17	17.32	<.001	
	3	7	110.33	19.49	<.001	
	4	2	94.48	3.63	.11	
	5	4	98.74	7.90	.01	
	6	5	97.44	6.59	.02	
	7	7	90.84	.00	.66	
	8	8	93.31	2.47	.19	

Note — k_i = number of parameters for model i; $AICc_i$ = Akaike information criterion (corrected) value for model i; $\Delta_i = AICc_i$ - minimum AICc value for the candidate set ($\Delta_i = 0$ for model with minimum AICc value); w_i = rounded Akaike weights; TPB:PMT = ratio of Akaike weights for model 5 (Theory of Planned Behaviour) to model 1 (revised version of Protection Motivation Theory), value represents how many times more likely it is that the Theory of Planned Behaviour is the best approximating model of the two models (values < 1 indicate that PMT-R is the superior model, values > 1 indicate that the TPB is the superior model); Model 1 = PMT-R (i.e., susceptibility, severity, response- and self-efficacy); Model 2 = PMT-R plus health knowledge; Model 3 = PMT-R plus prior behaviour; Model 4 = TRA (attitudes and injunctive norms); Model 5 = TPB (i.e., TRA plus self-efficacy and perceived controllability); Model 6 = Model 5 plus descriptive norms; Model 7 = Model 6 plus health knowledge; Model 8 = Model 7 plus prior behaviour.

Use nicotine replacement therapy.

Model 8 was the model with the greatest support for explaining intentions to use NRT during the next month; it was found to be clearly superior to models 1 – 6 (Δ_i > 13) and models 7 had considerably less support than model 8 (Δ_i > 5). The probability that model 8 was the best approximation of the data was calculated to be 94.32%. This suggests that descriptive norms, health knowledge and past use of NRT may each be useful additions to the TPB for predicting intentions to use NRT. The TPB was found to be 257.24 times as likely as PMT-R to be the best approximating model of the two models. The likelihood that the TPB was the superior model of the two was therefore greater than 99.50%. This suggests that the TPB should be preferred over PMT-R for predicting intentions to use NRT.

Avoid situations where I often feel the urge to smoke.

Model 7 was again found to have the lowest AICc value for participants' intentions to avoid situations where they often feel the urge to smoke. Model 7 was found to be clearly superior to models 1 – 3 (Δ_i > 15) and had considerably greater support than models 5 and 6 (Δ_i > 6). It was estimated likelihood that model 7 was the superior model was 66.23% compared with 10.76% for model 4 (TRA) and 19.27% for model 8. Given this large discrepancy it was judged that Model 7 was also most likely superior to models 4 and 8. These findings indicate that descriptive norms and past behaviour may be useful additions to the TPB for the purposes of predicting intentions to avoid cues in smokers. Comparison of Akaike weights revealed that the TPB was more 2500 times as likely to be the better approximating model when compared with PMT-R, suggesting it should be the preferred model for predicting individuals' intentions to avoid situations where they often feel the urge to smoke.

Testing the Proposed Integrated Model

A series of path analyses were conducted to test the predictions of the proposed integrated model for each of the smoking behaviours investigated. The standardised regression coefficients were generated from simultaneous multiple regression analyses investigating the predictors of attitudes, self-efficacy and intentions within the proposed integrated model. Conceptual diagrams of the path models are provided in figures 5.2-5.4.

Predictors of attitudes.

Hierarchical regression analyses with were utilised to test the predictions of the proposed integrated model regarding the predictors of attitudes for each of the health behaviours investigated. Block 1 contained susceptibility, severity and response-efficacy and block 2 contained threat and efficacy health knowledge. The bivariate relationship between these variables and attitudes can be viewed in the correlation matrices (tables 5.1 – 5.3). However, multiple regression analyses allow for exploration of the independent effect these variables exert on attitudes within the context of the proposed model. Power exceeded .90 to find a medium effect size ($f^2 = .25$) for all analyses.

Make a quit attempt. Hierarchical regression analysis revealed a significant model of attitudes towards making a quit attempt during the next month which explained 15.67% of its variance ($F(5,69) = 3.75$, $p < .01$, $f^2 = .19$). Susceptibility, severity and response-efficacy together explained 17.14% of the variance in attitudes ($F(3,71) = 6.10$, $p < .005$). However, only severity and response-efficacy were significant predictors The addition of the health knowledge variables did not contribute unique variance and detracted from the models' explanatory power ($\Delta F(2,69) = .38$, $p = .68$, $R^2 = .16$; see figure 5.2).

Use nicotine replacement therapy. Susceptibility, severity and response-efficacy were found to explain 17.50% of the variance in attitudes concerning the use of NRT products ($F(3,71) = 6.23$, $p < .001$). However, contrary to predictions only response-efficacy was a significant predictor. Health knowledge was not found to contribute significant unique variance to the model ($\Delta F(2,69) = 2.28$, $p = .11$). The final model explained 20.38% of the variance in intentions ($F(5,69) = 4.79$, $p < .001$, $f^2 = .26$; see figure 5.3).

Avoid situations where I often feel the urge to smoke. Hierarchical regression analyses revealed a significant model of participants attitudes concerning their avoiding situations where they often feel the urge to smoke ($F(5,69) = 3.66$, $p < .01$, $R^2_{Adj} = .15$; $f^2 = .18$). Susceptibility, severity and response-efficacy were found to explain 9.19% of the variance in attitudes ($F(3,71) = 3.50$, $p < .05$). However, the only significant predictor was response-efficacy. Threat and efficacy health knowledge together explained a further 6.05% of the variance in attitudes ($\Delta F(2,69) = 3.53$, $p < .05$, see figure 5.4).

Predictors of self-efficacy.

Hierarchical regression analyses were utilised to investigate the predictions of the proposed integrated model regarding self-efficacy. For each of the behaviours investigated block 1 contained perceived controllability, block 2 contained past behaviour and block three contained threat and efficacy health knowledge. The past behaviour variables for each of the health behaviours differed. For making a quit attempt past behaviour variables included number of cigarettes smoked per day, whether the participant has previously attempted to quit smoking (dummy variable: 1 = yes, 2 = no), the longest they have managed to stay abstinent (in days) and the age at which they

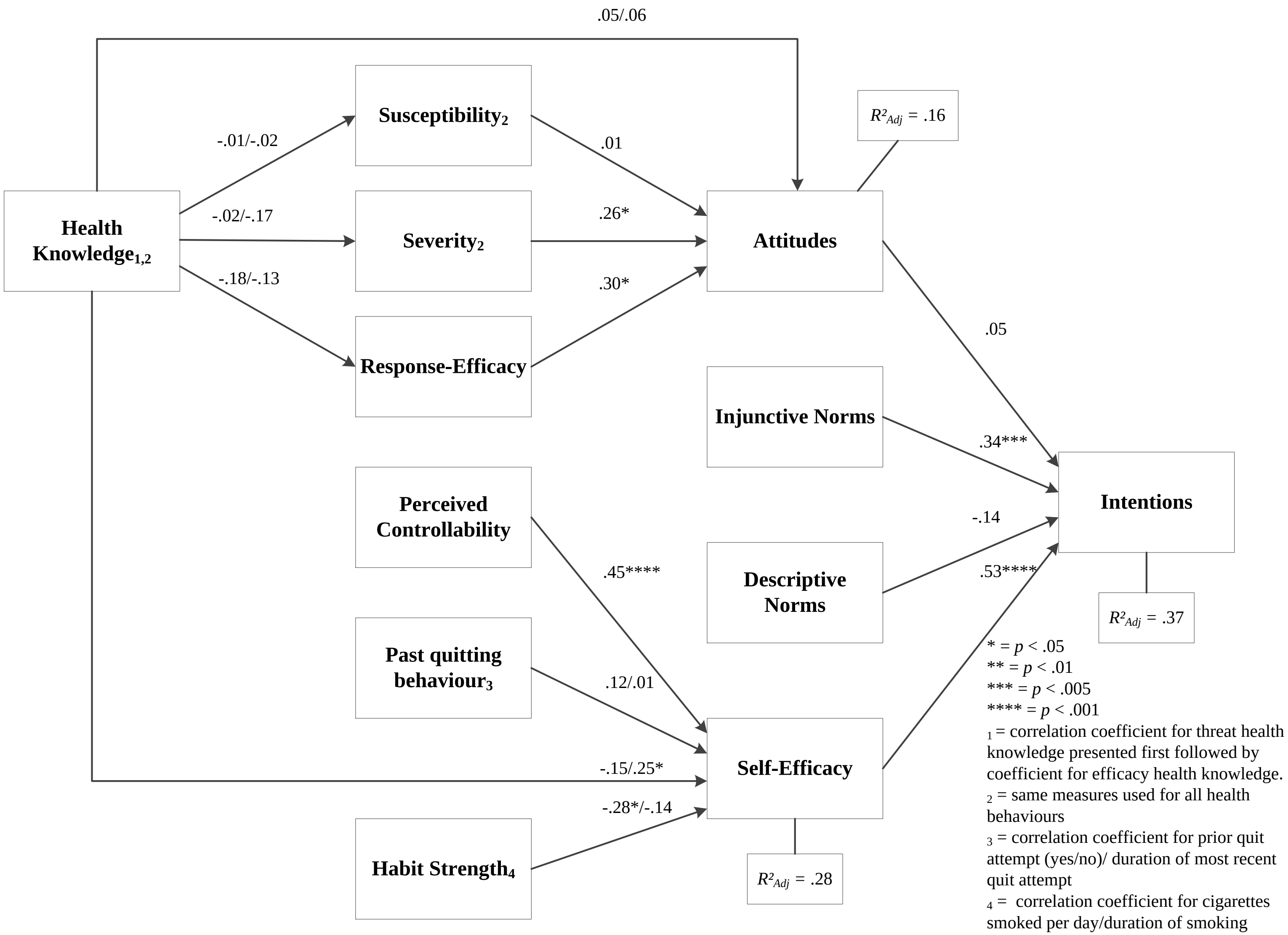

Figure 5.2. Application of the proposed integrated model to intentions to make a quit attempt: path model showing standardised beta coefficients for all proposed relationships.

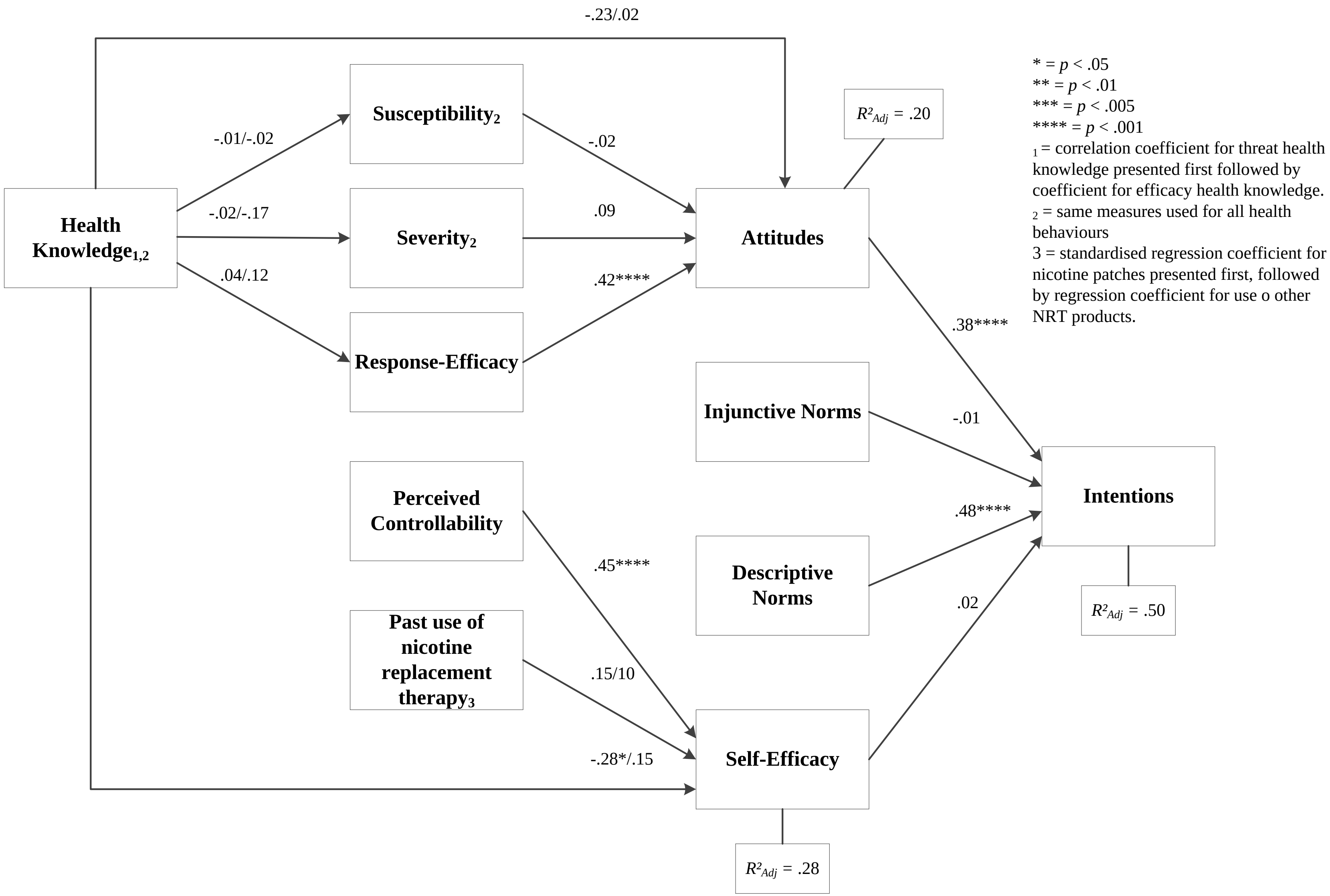

Figure 5.3. Application of the proposed integrated model to intentions to use nicotine replacement therapy during the next month: path model showing standardised beta coefficients for all proposed relationships.

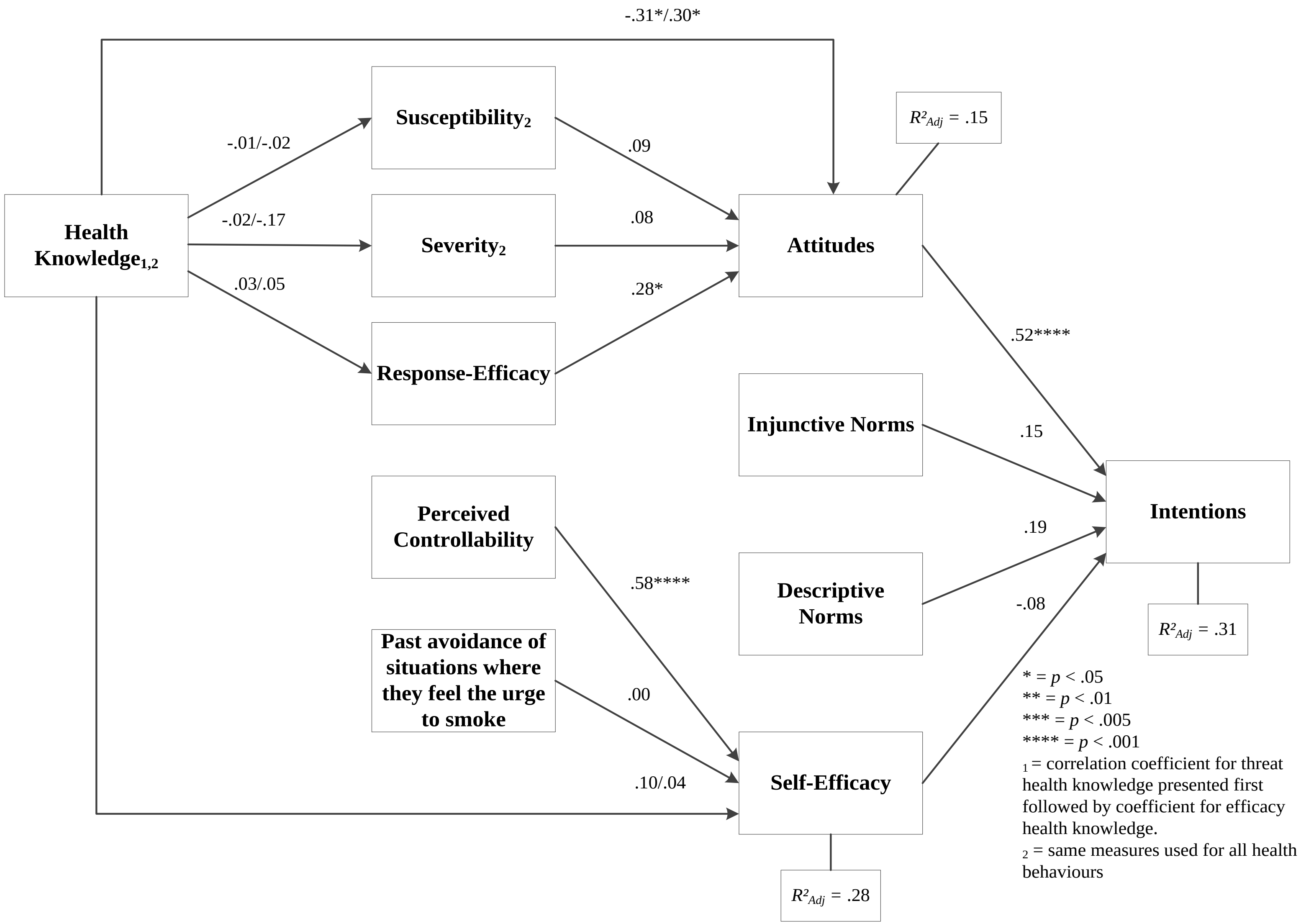

Figure 5.4. Application of the proposed integrated model to participants' intentions to avoid situations where they often feel the urge to smoke during the next month: path model showing standardised beta coefficients for all proposed relationships.

began smoking. For using nicotine replacement therapy the past behaviour variables were past use of nicotine patches and past use of other NRT products. For avoiding settings which increase the urge to smoke the past behaviour variable was past avoidance behaviour. Power exceeded .90 to find a small-medium effect size (f^2 = .15) for all analyses.

Make a quit attempt. Hierarchical regression analyses revealed a significant model of self-efficacy which explained 27.76% of its variance (F(7,67) = 5.06, p < .001, f^2 = .38; see figure 5.2). Perceived controllability explained 17.47% of the variance (F(1,73) = 16.67, p < .001). The past behaviour variables added a further 8.08% (ΔF(4,69) = 2.98, p < .05). However, number of cigarettes smoked per day was the only significant predictor, registering a negative beta value (β = -.31, p < .01). The addition of threat and efficacy health knowledge did not contribute to the model of quitting self-efficacy (ΔF(2,67) = 2.06, p = .14). However, efficacy health knowledge (i.e., knowledge concerning the health benefits of quitting smoking and effectiveness of quit aids) was found to be a significant predictor in the final model (β = .25, p < .05).

Use nicotine replacement therapy. Perceived controllability was found to explain 20.60% of the variance in self-efficacy concerning the use of NRT products (F(1,73) = 20.20, p < .001; see figure 5.3). However, contrary to predictions past use of nicotine patches and other NRT products were not significant predictors of self-efficacy (ΔF(2,71) = 2.55, p = .09). Further, the addition of threat and efficacy health knowledge to the model did not significantly increase its explanatory power (ΔF(2,69) = 2.86, p = .06). However, threat health knowledge was found to be a significant predictor of self-efficacy in the final model (β = -.28, p < .05). The final model was found to explain 27.62% of the variance in self-efficacy (F(5,69) = 6.18, $p < .001$, f^2 = .38).

Avoid situations where I often feel the urge to smoke. Perceived controllability was found to be a significant predictor of participants reported self-efficacy concerning their ability to avoid situations in which they often feel the urge to smoke (F(1,73) = 31.77, $p < .001$; see figure 5.4). Past avoidance of such situations (ΔF(1,72) < .01, p = .97) and threat and efficacy health knowledge (ΔF(2,70) = .83, p = .44) were not found to be significant predictors of self-efficacy and did not contribute significant unique variance to the model. The final model explained 28.04% of the variance in self-efficacy (F(4,70) = 8.21, $p < .001$), a medium-large effect size (f^2 = .39).

Predictors of intentions.

Multiple regression analyses were utilised to test the predictions of the proposed integrated model concerning intentions. Predictors included attitudes, injunctive and descriptive norms, and self-efficacy. Power exceeded .90 to find a small-medium effect size (f^2 = .15) for all analyses.

Make a quit attempt. Multiple regression revealed a significant model of intentions to make a quit attempt (F(4,70) = 11.66, $p < .001$, R^2_{Adj} = .37, f^2 = .58). However, contrary to predictions only injunctive norms (β = .34, $p < .005$) and self-efficacy (β = .53, $p < .001$) emerged as significant predictors.

Use nicotine replacement therapy. A significant model explaining 50.31% of the variance in intentions to use NRT during the next month was found (F(4,70) = 19.73, $p < .001$, f^2 = 1.02). However only attitudes (β = .38, $p < .001$) and descriptive norms emerged as significant predictors (β = .48, $p < .001$).

Avoid situations where I often feel the urge to smoke. Multiple regression revealed a significant model of participants intentions to avoid situations where they often feel the urge to smoke ($F(4,70) = 9.30$, $p < .001$, $R^2_{Adj} = .31$) a large effect size ($f^2 = .45$). Only attitudes ($\beta = .52$, $p < .001$) emerged as a significant predictor.

Mediation analyses.

The mediational hypotheses of the proposed integrated model were investigated using hierarchical regression analyses and bootstrapped point estimates (with 95% confidence intervals) for the change in regression coefficient following the addition of the mediator variable (5000 bootstrapped resamples; cf. Preacher et al., 2008). The proposed integrated model predicted that the effects of severity, susceptibility, response-efficacy and threat and efficacy health knowledge on intentions would be mediated by attitudes; and the effects of perceived controllability, past behaviour, habit strength and threat and efficacy health knowledge on intentions would be mediated by self-efficacy (see figure 5.1). Each of these relationships was investigated using hierarchical regression analyses. In all analyses the predictor variable was entered in the first step followed by the potential mediator variable in the second step. If the validity (i.e., magnitude of the relationship between the predictor and the outcome variable; cf. Tzelgov et al., 1991) of the predictor variable is significantly decreased in the second step, mediation is present. Although this analysis provides a clear picture of the mediators' effect on the validity of the predictor, it fails to account for the possible mediating (or suppressing) effect of other predictors in the regression model (cf. Preacher et al., 2008). As such, the Hayes et al. (in press) bootstrapping method was applied to assess the significance of the change in the validity of the predictor variable as a result of the effect of the mediator. This method allows for multiple independent and mediator variables to be investigated simultaneously and the effects of other predictors can be controlled. As such, this analysis can be used to investigate whether a mediation (or suppression) effect still holds within the context of a full regression model; as opposed to just in the three variable case. A summary of all the mediation analyses is presented in table 5.7.

Mediating effect of attitudes. Contrary to expectations attitudes did not mediate the effect of either susceptibility or severity on intentions for any of the health behaviours investigated. Attitudes also did not mediate the effect of response-efficacy on intentions to quit smoking. However, it did mediate this effect for intentions to use nicotine replacement therapy and participants' intentions to avoid situations where they often feel the urge to smoke. Although attitudes mediated the effect of threat health knowledge on participants' intentions to avoid situations where they often feel an urge to smoke, no such pattern emerged for intentions to make a quit attempt or use nicotine replacement therapy. No significant mediation effects were identified for efficacy health knowledge. However, the presence of attitudes in the model served to increase the predictive validity of efficacy health knowledge for predicting participants' intentions to avoid situations where they usually smoke. This pattern of results indicates suppression (Pandey et al., 2010; Tzelgov et al., 1991). Investigation of the correlation matrices (see table 5.3) indicated that efficacy health knowledge was uncorrelated with intentions (r = -.14, p = .23). This suggests that the suppression situation is classical not reciprocal, with efficacy health knowledge removing criterion irrelevant variance in attitudes (cf. Tzelgov et al.).

Mediating effect of self-efficacy. Self-efficacy was found to affect the predictive validity of perceived controllability for intentions to make a quit attempt, use nicotine patches and use nicotine lozenges/chewing gum. Self-efficacy fully mediated the effect of perceived controllability on intentions to make a quit attempt. However, the presence

Table 5.7

Direct Effects of Severity, Response-efficacy, Perceived Control, Past Behaviour and Threat and Efficacy Health Knowledge on Intentions Before and After Controlling for Mediating Variables, with Accompanying Bootstrapped Point Estimates and 95% Confidence Intervals

Health Behaviour			Bootstrapping[1]			
					95% CI	
	β_{yx}	$\beta_{yx.m}$	Point Estimate	*SE*	Lower	Upper
SUSC (*x*) → ATT (*m*) → INT (*y*)						
Quit smoking	.04	.01	.00	.02	-.03	.06
Nicotine replacement therapy	.16	.11	-.01	.07	-.15	.13
Avoidance	.23*	.12	.22	.11	-.10	.27
SEV (*x*) → ATT (*m*) → INT (*y*)						
Quit smoking	.29*	.25*	.03	.08	-.05	.28
Nicotine replacement therapy	.04	-.09	.06	.11	-.15	.29
Avoidance	.00	-.11	.07	.14	-.21	.38
RE (*x*) → ATT (*m*) → INT (*y*)						
Quit smoking	.27*	.23	.04	.06	-.06	.22
Nicotine replacement therapy	.41****	.19	.24†	.08	.11	.41
Avoidance	.26*	.09	.22†	.11	.01	.47
PC (*x*) → SE (*m*) → INT (*y*)						
Quit smoking	.33***	.13	.33†	.12	.14	.63
Nicotine replacement therapy	-.01	-.27*	.32ǂ	.11	.15	.59
Avoidance	.10*	.03	.18	.15	-.11	.47
PB (*x*) → SE (*m*) → INT (*y*)						
Quit smoking[2]						
Quit attempt	.29*	.23*	.23	.23	-.15	.81
Quit duration	.19	.15	.00	.00	.00	.00
Cigarettes per day	-.11	.05	-.03†	.02	-.09	-.01
Smoking duration	-.23*	-.15	-.01	.01	-.04	.01
Nicotine replacement therapy						
Nicotine patches	.33***	.25*	.35	.20	-.01	.78
Other NRT	-.003	-.11	.24	.24	-.18	.78
Avoidance	-.08	-.07	.00	.02	-.02	.06
Threat HK (*x*) → ATT (*m*) → INT (*y*)						
Quit smoking	-.19	-.19	.00	.02	-.03	.04
Nicotine replacement therapy	-.37***	-.26**	-.06	.04	-.17	.004
Avoidance	-.33***	-.26**	-.14†	.06	-.28	-.03
Efficacy HK (*x*) → ATT (*m*) → INT (*y*)						
Quit smoking	-.13	-.13	.00	.01	-.02	.04
Nicotine replacement therapy	-.20	-.15	.01	.02	-.05	.05
Avoidance	-.14	-.21*	.09ǂ	.04	.01	.19

Table 5.7 Continued

Health Behaviour	β_{yx}	$\beta_{yx.m}$	Bootstrapping[1] Point Estimate	*SE*	95% CI Lower	Upper
Threat HK (x) → SE (m) → INT (y)						
Quit smoking	-.19	-.18	-.07	.06	-.20	.02
Nicotine replacement therapy	-.37***	-.27*	-.04	.03	-.12	.003
Avoidance	-.33***	-.33***	.00	.02	-.03	.08
Efficacy HK (x) → SE (m) → INT (y)						
Quit smoking	-.13	-.20*	.08ǂ	.05	.00	.19
Nicotine replacement therapy	-.20	-.16	.01	.02	-.01	.06
Avoidance	-.31**	-.27*	.00	.02	-.03	.04

Note. x = predictor, m = mediator, y = outcome variable (in all cases intentions), β_{yx} = direct effect of predictor on intentions, $\beta_{yx.m}$ = direct effect of predictor on intentions after controlling for the mediator, SEV = severity, ATT = attitudes, RE = response-efficacy, PC = perceived controllability, SE = self-efficacy, HK = health knowledge, INT = intentions, NRT = nicotine replacement therapy. $_1$ = point estimate and confidence intervals calculated using 5000 bootstrapped resamples, $_2$ = four separate measures of past behaviour used as predictors,* = $p < .05$, ** = $p < .01$, *** = $p < .005$, **** = $p < .001$, † = bootstrapped confidence interval does not contain zero, implying that decrease in magnitude of unstandardised regression coefficient of x as a result of m is different from zero (i.e., mediation). ǂ = bootstrapped confidence interval does not contain zero, implying that increase in magnitude of unstandardised regression coefficient of x as a result of m is different from zero (i.e., suppression).

of self-efficacy in the model increased the predictive validity of perceived controllability to predict intentions to use nicotine replacement therapy. This indicates a suppression effect (Tzelgov et al., 1991). In this case perceived controllability was uncorrelated with intentions. As such, perceived controllability acted as a suppressor variable within the regression equation, increasing the predictive validity of self-efficacy (i.e., classical suppression). This indicates that intentions were uncorrelated with the shared variance between self-efficacy and perceived controllability. As predicted, self-efficacy mediated the effect of cigarettes smoked per day on intentions. However, contrary to expectations self-efficacy did not mediate the effect of prior quit attempts, length of the most recent quit attempt, number of years since the uptake of smoking on intentions to quit smoking. Self-efficacy also did not mediate the effect of past use of NRT products on intentions to use NRT products, and did not mediate the effect of participants past avoidance of situations where they often feel the urge to smoke on their intentions to avoid these situations. Contrary to predictions, self-efficacy did not mediate the effect of threat or efficacy health knowledge on intentions for any of the three health behaviours investigated. However, the addition of self-efficacy to a model regressing intentions to quit smoking on efficacy health knowledge, increased the predictive validity of efficacy health knowledge. This indicates that efficacy health knowledge may have acted as a suppressor variable, supressing irrelevant variance in self-efficacy. This suggests that intentions to quit smoking are uncorrelated with the shared variance between self-efficacy and efficacy health knowledge.

Discussion

The aims of Study 2 were to investigate the predictors of intentions to make a quit smoking attempt, use NRT and avoid situations which induce cravings during the next month. Both the TPB and PMT were found to be useful models for predicting smoking behaviour intentions explaining a significant proportion of the variance. However, the TPB was found to have greater predictive power for all three health behaviours. The TPB was found to explain between 28 and 36% of the variance in smoking behaviour intentions compared with 26-31% for PMT. Further the addition of health knowledge and past behaviour to TPB and PMT significantly increased both models' prediction of smoking behaviour intentions.

The predictions of a proposed integrated model were also tested, but were only partially supported. Intentions to quit smoking were predicted by injunctive norms and self-efficacy. Self-efficacy with regards to quitting smoking was predicted by perceived controllability, efficacy health knowledge and fewer cigarettes smoked per day. Attitudes about quitting smoking were predicted by perceived severity of the health effects of smoking related illnesses and perceived response-efficacy of quitting. Intentions to use NRT products was predicted by attitudes about using these products and descriptive norms. Self-efficacy with respect to using NRT was predicted by perceived controllability and less health knowledge about the health effects of smoking. Attitudes were predicted by response-efficacy only. Participants' intentions to avoid situations where they often feel the urge to smoke were predicted by relevant attitudes only. Self-efficacy with respect to avoiding these situations was predicted by perceived controllability only and attitudes were predicted by response-efficacy only. This suggests that although many of the predictions of the proposed integrated model were supported, several others were not (see also figures 5.2-5.4). In this section the effectiveness of both the TPB and PMT-R in predicting intentions to quit smoking, use NRT and avoid situations where participants' urge to smoke is increased will be discussed. This will be followed by a discussion of how these models compare in terms of their accuracy for predicting intentions. Finally, the findings relevant to the proposed integrated model and its theoretical implications will be discussed.

Application of PMT-R and TPB to the Prediction of Intentions to Make a Quit Attempt

Protection Motivation Theory.

The only significant PMT-R predictor of intentions to make a quit attempt was self-efficacy. This indicates that an important determinant of quitting intentions is individuals' belief that they could successfully quit smoking. Although significant bivariate relationships were observed between both perceived severity and response-efficacy and intentions, these predictors were non-significant within the context of the full PMT-R model. Maddux et al. (1983) also found that self-efficacy perception was the strongest predictor of intentions to quit smoking. Research applying PMT-R to diet and exercise (e.g., Lippke et al., 2009; Plotnikoff et al. 1995; Plotnikoff, Rhodes et al., 2009) and breast self-examination (e.g., Hodgkins et al., 1998) has found similar results. These findings provide only limited support to the PMT-R's predictions, which would suggest that both threat (susceptibility and severity) and coping appraisal variables (self- and response-efficacy) will contribute to the prediction of intentions.

Importantly individuals were not motivated to a quit smoking attempt by their belief that they were susceptible to smoking related health problems. These results support previous research which suggests that the effect of perceived susceptibility on intentions to quit smoking is either weak or non-significant (e.g., Greening, 1997; Maddux et al., 1983; Rogers et al., 1976). This finding appears to contradict a central assumption of fear appeal persuasiveness – that individuals will be motivated to change their health behaviour if they believe that they are susceptible to adverse health effects. Anti-smoking advertising often employs the tactic of highlighting all the adverse health effects of smoking in graphic detail (e.g., National Tobacco Campaign, 2000). It would seem that the rationale behind this approach is to increase smokers' awareness of the health effects of smoking that they are susceptible to as a result of their behaviour. The results of this study suggest that such an approach may be ill-advised; individuals are not motivated to quit smoking by their perceptions of susceptibility to smoking-related illnesses. Research has suggested that messages which highlight smoker's personal susceptibility to smoking related illnesses have little direct effect on their intentions to quit smoking (e.g., Maddux et al., 1983; Pechmann, Zhao, Goldberg & Reibling, 2003; Rogers et al., 1976). Health promotion practitioners should focus on raising smokers' self-efficacy with respect to quitting. This may be achieved through advertising successful behavioural and psychological interventions, disseminating personally tailored self-help materials or simple advice from medical specialists or allied health practioners (Lancaster et al., 2000; Prochaska, DiClemente, Velicer & Rossi, 1993).

Theory of Planned Behaviour.

The results of the present study indicated that intentions to quit smoking were primarily influenced by individuals' perceptions that others would approve if they were to quit smoking and the belief that they would be successful in a quit attempt. These factors explained approximately 35% of the variance in intentions to quit smoking lending support to the TPB. In line with previous research, self-efficacy (a component of PBC) emerged as the most important predictor of quitting intentions (e.g., Godin, Valois, LePage & Desharnais, 1992; Moan & Rise, 2006; Norman, Conner & Bell, 1999). However, other findings suggest that PBC is a less important or non-significant predictor (e.g., Bledsoe, 2006; Higgins & Conner, 2003; Moan & Rise, 2005).

Contrary to the predictions of the TPB attitudes was not associated with intentions. This finding is counterintuitive as it is reasonable to expect that individuals would be more likely to intend to quit if they believe that quitting will be associated with positive outcomes. The findings of the present study suggest that such beliefs have no bearing on quitting intentions. Despite the counter-intuitiveness of these results, at least one other study has found that attitudes have no significant bearing on individuals' intentions to quit smoking (Norman et al.). However, these findings run contrary to the preponderance of previous findings which suggest that attitudes are a significant predictor of intentions to quit smoking (e.g., Bledsloe; Godin et al.; Higgins et al.; Hu & Lanese, 1998; McEachan et al., 2011; Moan et al., 2005, 2006; Rise, Kovac, Kraft, Moan, 2008). Measures of intentions and attitudes were generally similar between the present study and these prior findings. A review of the methodology applied in previous studies did not reveal any systematic differences in measures of attitudes and intentions which would obviously account for this difference. However, some subtle differences in the semantic differential scales used to measure attitudes (e.g., wrong/right, not useful/useful [Moan et al., 2005]; useless/useful [Moan, 2006]; harmful/beneficial, foolish/wise [Higgins]) and measures of intentions ("How certain are you that you could resist smoking this term? (very certain-not at all certain)" [Higgins, pp. 177]) in other studies may account for the difference in findings. However, why such subtle differences would lead to different results is unclear. Given the preponderance of evidence to the contrary, the lack of an effect of attitudes on quitting intentions in the present study may have been an anomalous result. Nevertheless, the findings of the present study suggest expected positive personal outcomes of quitting smoking do not motivate individuals to intend to quit smoking. However, they may be motivated by expected social disapproval associated with continued smoking and how easy they believe it will be to quit.

Principal components analysis demonstrated that self-efficacy and perceived controllability were distinct constructs, confirming previous research (e.g., Terry et al., 1995; Armitage et al., 1999a, 1999b). However, contrary to the predictions of the TPB only self-efficacy was a significant predictor of intentions, perceived controllability did not add significant variance. This finding supports previous research which has suggested that only self-efficacy is an important predictor of health behaviour intentions (e.g., Armitage et al., 1999a, 1999b; Garcia et al., 2003, Study 2; Manstead et al., 1998; Rhodes et al., 2003; White et al., 1994). Also contrary to predictions, the addition of descriptive norms to the model did not increase the prediction of quitting intentions. Although there is research to suggest that descriptive norms add to the prediction of intentions within the TPB (e.g., Conner et al., 1999; McMillan et al., 2003a; McMillan, Higgins & Conner, 2005; Rise et al., 2008; Rivis et al.; Sheeren et al.; White et al., 1994), other findings suggest that it is not a significant predictor after controlling for the effects of attitudes, injunctive norms and PBC (e.g., McMillan et al., 2003b; Povey et al., 2000b). These results suggest that, like injunctive norms, (cf. Ajzen, 1991; Armitage et al., 2001; Conner et al., 1998; Rivis et al., 2003), descriptive norms may be a less reliable predictor of intentions than attitudes or PBC. Therefore the results of the present study suggest that both perceived controllability and descriptive norms are not important predictors of intentions to quit smoking within the context of the TPB.

Application of PMT-R and TPB to the Prediction of Intentions to Use NRT

Protection Motivation Theory.

Intentions to use NRT during the next month were found to be predicted by response- and self-efficacy. These findings suggest that individuals should intend to use NRT if they believe that they will be effective in reducing nicotine cravings and believe that they are capable of using them appropriately. These findings lend partial support to the predictions of PMT-R as only individuals coping appraisal impacted on their intentions. Individuals' belief that they were susceptible to severe health effects associated with smoking was not important for determining their intentions to use NRT. This finding echoes a large proportion of the extant PMT-R research which suggests that perceptions of threat are much less important in predicting intentions and behaviour when compared with perceptions of coping resources (e.g., Bui et al., 2013; Lippke et al., 2009; Floyd et al., 2000; Hodgkins et al., 1998; Maddux et al., 1983; Milne et al., 2000; Plotnikoff et al. 1995; Plotnikoff, Rhodes et al., 2009; Plotnikoff et al., 2010; Plotnikoff, Trinh et al., 2009; Rogers et al., 1976).

Theory of Planned Behaviour.

Of the TPB variables only attitudes were found to predict intentions to use NRT. This suggests that individuals will be most likely to use NRT if they believe that doing so will be associated with more positive (and fewer negative) outcomes. An explanation for the lack of effect of self-efficacy and perceived controllability on intentions may be that NRT products are fairly easy to use and obtain. They are quite inexpensive, available over-the-counter at pharmacies and supermarkets and only have to be applied to the skin once per day. As a result, there are few substantial barriers to individuals using NRT if they are so inclined. Ajzen (1991) suggests that PBC is only likely to significantly impact on intentions and behaviour when the behaviour is relatively simple to perform. Therefore, these findings support the predictions of the TPB as using NRT is a relatively simple to perform.

Although injunctive norms were not an important predictor of intentions to use NRT, descriptive norms were the most important predictor. This finding provides strong support for the addition of descriptive norms to the TPB for predicting intentions to use NRT. This suggests that individuals are most likely to use NRT if somebody they know and respect has also used nicotine patches to assist with a quit attempt. This may suggest that peer pressure may be an important motivation for NRT use. An alternative explanation may be that there is some scepticism as to the effectiveness of NRT for assisting quit attempts (cf. Etter et al., 2001). However, individuals may be more likely to accept that NRT is effective if they have observed a peer or family member use NRT to successfully quit smoking. This interpretation is supported by a significant positive correlation between descriptive norms and response-efficacy (r = .31, p < .01; see table 5.2).

Application of PMT-R and TPB to the Prediction of Participants' Intentions to Avoid Situations where they often feel the Urge to Smoke

Protection Motivation Theory.

Participants' intentions to avoid situations where they often feel the urge to smoke were found to be predicted by susceptibility, severity and response-efficacy. Contrary to expectations, self-efficacy was not a significant predictor of intentions. Further the bivariate association between self-efficacy and intentions was non-significant. Ajzen (1991) suggests that self-efficacy may not predict behaviour when enactment of that behaviour is relatively simple. However, avoiding situations which induce cravings is not obviously an easy thing to do. Many smokers experience cravings when they have a coffee, go out with particular friends or inhale somebody else's smoke. It is reasonable to expect that smokers would have considerable trouble completely avoiding these situations. Further exposure to some of these cues may not be under volitional control; individuals may inhale somebody else's smoke simply walking from place to place, they may not be able to completely avoid friends for fear of seeming antisocial. As such, both PMT-R and the TPB would predict that self-efficacy should be an important predictor of avoidance intentions. As such, these findings are inconsistent with the predictions of these models and elude explanation in terms of these models.

Exploratory analysis revealed that severity was likely acting as a suppressor variable for susceptibility within the regression equation. As such, the effect of susceptibility on intentions is not due to its shared variance with severity. Therefore, this suggests that smokers are most likely to avoid situations where they often feel the urge to smoke when they believe that doing so will be effective in reducing their nicotine cravings, and believe that they are susceptible to adverse health effects associated with smoking. Individuals' belief that they will be successful in avoiding situations where they often feel the urge to smoke was not found to be an important motivating factor.

Theory of Planned Behaviour.

The only significant TPB predictor of participants' intentions to avoid situations where they often feel the urge to smoke was their attitudes concerning the avoidance of these situations. This suggests that smokers are more likely to develop intentions to avoid such situations when they believe that doing so will be associated with positive outcomes. This finding echoes the results of the PMT-R analysis. A response which is believed to be effective in reducing nicotine cravings (response-efficacy) is likely to be seen as a positive outcome of engaging in that response. A significant bivariate correlation was also found for descriptive norms, however it did not emerge as a significant predictor of intentions in the final TPB model. These findings lend partial support to the predictions of the TPB.

Other Predictors of Intentions: Health Knowledge, Past Behaviour and Habit Strength

Health knowledge, past behaviour and smoking habit strength were also utilised as predictors of intentions within the PMT and TPB in order to investigate whether these variables can increase the predictive power of these models. Previous quit attempts were found to predict intentions to make a quit attempt after controlling for the PMT-R and TPB variables. Previous use of nicotine patches also increased the predictive power both models to explain intentions to use NRT during the next month. These results echo results which suggest that previous quit attempts predict quitting intentions and behaviour (e.g., Ellerman et al., 2012; Hyland et al., 2006; Zhou et al., 2009). Findings in both the TPB (e.g., Conner et al., 1998; Hagger et al., 2002, 2009; McEachan et al., 2011; Sandberg et al., 2008) and PMT-R literature (e.g., Abraham et al., 1994;

Hodgkins et al., 1998; Maddux, 1993; Van der Velde et al., 1991) suggest that past behaviour often adds to the prediction of both intentions and behaviour even after controlling for these model's constructs. Given that quit attempts are not performed continuously or on a regular basis it is unlikely that the effect of past behaviour on future intentions could be explained by the formation of a quitting smoking habit (cf. Ouellette et al., 1998; Ajzen, 2002b). Given that an individual has made a quit attempt previously, it is reasonable to assume that they, at least at one point in their life, intended to quit smoking. These prior intentions may have been determined by a set of psychosocial factors which are still operating on the individual's current intentions to quit. As such, the residual effect of past behaviour on future intentions may be a spurious relationship which may be mediated by some unmeasured factor (cf. Ajzen, 2002b).

The duration of participants' smoking was found to be negatively associated with quitting intentions. These results support previous findings which have suggested that the length of time a person has been a smoker is negatively associated with quitting intentions and behaviour (e.g., Chen et al., 1998; Ellerman et al., 2012; Hellman et al., 1991; Khuder et al., 1999). DiClemente (2003) suggested that individuals who have been smoking over a long period of time may feel resigned to the fact that they will never be able to successfully quit smoking. The present study provided support for this contention, suggesting that the duration of one's smoking habit may adversely affect smokers' motivation to make a quit attempt.

Threat health knowledge was found to be negatively associated with intentions to use NRT and avoid situations where participants often felt the urge to smoke. This finding is somewhat counterintuitive as it would be reasonable to expect that individuals who are knowledgeable about the adverse health effects associated with smoking would be more likely to be motivated to adopt protective responses. Generally participants believed that smoking related illnesses were very severe (*M* = 6.26 [out of 7], *SD* = 1.15) and believed that they were susceptible to these effects (*M* = 4.89, *SD* = 1.57). Therefore, a floor effect in perceptions of threat could not account for this counterintuitive finding. It is possible that smokers are not motivated to action by perceived threats to health and thus knowledge of these threats is not motivating. In support of this view, relationships between intentions and both severity and susceptibility were weak or non-significant. In contrast, normative influences and attitudes were often significant predictors of intentions. This indicates that individuals were more likely to be motivated by the perceived benefits or the social impact of engaging in a quit smoking behaviour.

However, this explanation does not account for why individuals who know more about the health effects of smoking are *less* likely to intend to change their behaviour. This finding may have profound implications for health promotion practice as it suggests that educating smokers about the health risks associated with tobacco may not only be ineffective but may actually be counterproductive, decreasing their uptake of certain behaviours consistent with quitting. Information concerning the health risks associated with smoking is often presented in a paternalistic way. This information is presented frequently in fear appeal messages (National Tobacco Campaign, 2000) and other media. Friends, family and health practitioners may also implore smokers to quit due to the ramifications for health. The implication of this information is emphatically “these are the reasons why you should quit smoking” and “you should quit smoking to avoid the negative effects on your health”. This may be perceived as an attack on the smokers’ freedom leading to a reactance response (Brehm, 1966; Brehm & Brehm, 1981). Reactance has been found to be negatively associated with intentions to engage in health protective behaviour (e.g., Ruiter et al., 2003; Rippetoe et al., 1987; Witte, 1992b; Witte & Allen, 2000). Other research has shown that smokers often respond with reactance to antismoking messages, especially those that are strident in parading the negative health effects of smoking (e.g., Erceg-Hurn et al., 2011; Wolburg, 2006). Ironically, it may be that bombarding smokers with reasons why they should quit smoking may increase their resolve to continue smoking as a means of restoring their self-esteem (cf. Arndt, Schimel, & Goldenberg, 2003; Brehm, 1966; Brehm & Brehm, 1981; Greenberg, Solomon & Pyszczynski, 1997; Jessop & Wade, 2008; Routledge, Arndt & Goldenberg, 2004; Taubman Ben-Ari, Florian, & Mikulincer, 1999). Unfortunately reactance and other defensive responses were not measured in the present study so these proposed effects were unable to be explored.

Comparative Analyses

The findings of the present study lend support to both PMT-R and TPB, indicating that each model is useful for predicting smoking behaviour intentions. For all three health behaviours the TPB was found to be a better approximating model to the data than the PMT-R. This indicates that the TPB is likely to be a more useful model than the PMT-R for predicting health behaviour intentions pertinent to quitting smoking. The underperformance of PMT-R is likely attributable to the relatively weak effects that the unique variables from that model (i.e., severity, susceptibility and response-efficacy) exerted on behavioural intentions for all health behaviours. The unique variables from the TPB (i.e., attitudes, injunctive and descriptive norms) were generally more strongly associated with intentions. These findings indicate that the TPB should be preferred over PMT-R for predicting and understanding health behaviour intentions related to quitting smoking.

However, both models may also be inadequate. The addition of auxiliary variables (i.e., health knowledge, prior behaviour and smoking habit strength) increased the predictive power of both the PMT-R and TPB. For all three health behaviours the best approximating model to the data was the TPB. However, in all cases the addition of health knowledge and past behaviour increased the predictive power of the TPB and PMT-R. Following the addition of these auxiliary variables the variance explained by the TPB was increased by 7 – 11%. The difference for PMT-R was 5 – 13%. This indicates that both models may be incomplete as they require augmentation to optimise their predictive power when applied to smoking behaviour intentions. Ajzen (1991) argued that one way to test the sufficiency of the TPB was to investigate the impact of past behaviour on future behaviour. If the model was sufficient there should be no residual impact of past behaviour after controlling for the TPB constructs. Following this line of reasoning Fishbein et al. (2010) identified several studies which had found a residual impact of past behaviour on intentions after controlling for the effects of the main TPB variables (see also Hagger et al., 2002b; McEachen et al., 2011). These findings suggest that the TPB constructs of attitudes, subjective norms and PBC may be insufficient to account for behavioural intentions. Fishbein et al. further argued that other variables may need to be added to the model to account for this missing variance and that these variables “are captured, at least in part, by measures of past behaviour” (pp. 290). Therefore, although the TPB is definitely a useful model for predicting health behaviour intentions, its explanatory power may be increased following careful modification to its structure and predictors.

Discussion of the Findings Pertaining to the Proposed Integrated Model

The present study also tested the predictions of an integrated model which adopted predictions from the TPB, PMT-R and Maddux’s (1993) revised Theory of Planned

Behaviour. Partial support was obtained for the proposed integrated model for predicting behavioural intentions, attitudes and self-efficacy. Contrary to predictions health knowledge did not impact on perceptions of susceptibility, severity or response-efficacy for any of the health behaviours investigated. Further, threat health knowledge was found to be either unassociated or negatively associated with attitudes and self-efficacy. Therefore, possessing such information either does not affect or is negatively associated with more proximal predictors of intentions. These findings suggest that the dissemination of such information (such as though fear appeals) is unlikely to increase quitting behaviour among smokers. These findings further suggest that interventions which focus on highlighting the negative health effects associated with smoking may be less likely to be effective or may even lead to counterproductive outcomes.

Efficacy health knowledge was generally unassociated with attitudes and self-efficacy but for two exceptions: attitudes concerning participants' avoidance of situations were they often have the urge to smoke; and self-efficacy concerning quitting smoking. On the face of it, this finding appears to support the notion that increased knowledge concerning health protective behaviour is desirable as it may impact on the development of more positive attitudes and self-efficacy concerning quitting behaviours. However, the results of this study suggested that in both cases efficacy health knowledge was a suppressor variable. What this suggests is that participants' intentions to avoid situations where they often feel the urge to smoke were uncorrelated with the shared variance between attitudes and efficacy; and intentions to make a quit attempt was uncorrelated with the shared variance between and self-efficacy and efficacy health knowledge. In other words attitudes were a predictor of intentions but this effect cannot be attributed to its positive relationship with efficacy health knowledge. Similarly, although self-efficacy was a predictor of intentions, this relationship had nothing to do with its positive association with efficacy health knowledge. Efficacy health knowledge only suppressed error variance in attitudes and self-efficacy. Taken together these findings suggest that increased knowledge concerning a health issue (regardless of whether it is threat or efficacy related) has no positive impact on individual's intentions to quit smoking, use NRT or avoid situations where they often feel the urge to smoke.

As predicted, response-efficacy was found to be a predictor of attitudes for all three behaviours investigated. This indicates that individuals' are more likely to generate positive attitudes concerning quitting smoking when they believe that that quitting smoking will be effective in alleviating the adverse health effects associated with smoking. This makes intuitive sense as reducing the impact of smoking related illnesses is likely to be perceived as a positive outcome associated with quitting smoking. This finding is consistent with the findings of Rhodes et al. (2008) who found a positive correlation between measures of response-efficacy and attitudes. Further, attitudes were found to mediate the effect of response-efficacy on intentions to use NRT and participants' intentions to avoid situations where they often feel the urge to smoke. However, contrary to Maddux's (1993) predictions susceptibility was not found to be associated with attitudes for any of the behaviours investigated and severity was only a significant predictor for intentions to quit smoking. Therefore, response-efficacy is likely to be an important determinant of attitudes, but perceptions of susceptibility and severity are not. These results support previous findings in the literature suggesting that coping appraisal (but not threat appraisal) is associated with more positive attitudes concerning health behaviours (e.g., Ruiter et al., 2003; Witte, 1992b, 1994).

Perceived controllability was found to be a significant predictor of intentions for all three health behaviours investigated. This finding was unsurprising as despite several findings indicating that self-efficacy and perceived controllability are conceptually distinct (e.g., Terry et al., 1995; Armitage et al., 1999a, 1999b), these constructs are almost always positively associated (e.g., Armitage et al., 1999a; Hagger et al., 2002; Povey et al., 2000a). Self-efficacy was found to fully mediate the effect of perceived controllability on intentions to quit smoking. This suggests that individuals' beliefs that they have control over whether they make a quit attempt is insufficient to determine quitting intentions they must also believe that they will be capable of successfully quitting.

The number of cigarettes smoked per day was found to be negatively associated with self-efficacy. This suggests that individuals who smoke more cigarettes lack confidence in their ability to successfully quit smoking. This finding supports DiClemente's (2003) argument that many heavy smokers may want to quit smoking but believe that they would be incapable of doing so. Self-efficacy was found to fully mediate the effect of number of cigarettes smoked per day on intentions to quit. This provides strong evidence that heavy smokers do not intend to quit because they believe that their quit attempts will be ultimately unsuccessful.

In summary the findings of the present study suggest that many of the predictions of the PMT-R may be incorporated into the TPB. Response-efficacy was found to be a key determinant of attitudes, likely because high response-efficacy can be understood as a positive outcome of engaging in protective health behaviour. However, susceptibility and severity were not important predictors of either attitudes or intentions. Self-efficacy is a key predictor in both models. As such, the proposed integrated model highlighted that theoretical integration can be utilised to investigate relationships between theoretical models and develop a relatively simple model which provides a richer account of health behaviour intentions than either of its two constituent models.

The results of this study further suggest that theoretical integration can be utilised to develop our understanding of the relations between constructs from separate models. With the large number of extant models being applied to health behaviour, many of which making very similar or identical predictions, it is important to identify and understand connections between these models. This can allow us to identify general cross-theoretical principles of predicting health behaviour (Maddux, 1993; Noar et al., 2005). This is desirable as it serves to simplify and reconcile the health behaviour literature as a whole (cf. Hagger, 2009; Maddux). Reconciliation of the health behaviour literature may be achieved through further research which employs theoretical integration (cf. Hagger, 2009, 2010).

Summary

The present study compared the utility of the PMT-R and TPB for predicting participants' intentions to quit smoking, use NRT and avoid situations where they often feel the urge to smoke. Although both models were useful for predicting intentions, the TPB garnered greater support. However, the addition of health knowledge and past behaviour explained further variance after controlling for attitudes, injunctive/descriptive norms and PBC. Evidence was also provided for a proposed integrated model which incorporated predictions from the TPB, PMT-R and Maddux's (1993) revised version of TPB. Findings suggested that PMT-R could be incorporated into a theoretical framework based on the predictions of the TPB, such that the predictions of both models were compatible. Importantly response-efficacy was found to be a key predictor of attitudes. The findings of the present study highlight the utility of theoretical integration for developing our understanding of the relationships between constructs contained within different health behaviour models.

Chapter 6: Study 3 – Comparing and Integrating the Predictions of Protection Motivation Theory and the Theory of Planned Behaviour in the Context of Obesity, Diet and Exercise

Rates of overweight/obesity continue to increase in Australia and around the world (AIHW, 2010; WHO, 2000, 2002, 2014). Excess body weight and behaviours which contribute to this (i.e., poor diet, physical inactivity) are a considerable burden on the health system – being associated with several health problems including coronary heart disease, type II diabetes and stroke (e.g., AIHW, 2010; Begg et al., 2007; see Chapter 2). Individuals who do not exercise regularly and maintain a poor diet consisting of high fat and high sugar foods increase their risk of becoming overweight/obese and experiencing weight-related health problems (ABS, 2010; AIHW, 2010, 2011, 2012; Anderson & Butcher, 2006; Begg et al.; Malik, Schulze & Hu, 2006; OECD, 2011; WHO, 2002). Both fast food (e.g., Isganaitis & Lustig, 2005; Rosenheck, 2008) and soft drink (e.g., Anderson et al.; Berkey, Rockett, Field, Gillman & Colditz, 2012; Ludwig, Peterson, & Gortmaker, 2001; Malik et al.) consumption have been strongly linked to weight gain and obesity. Study 3 aims to investigate the predictors of intentions to engage in six health behaviours which reduce individuals risk developing health problems associated by obesity: exercising 30 minutes per day five days per week; maintaining a healthy diet; avoiding foods high in fat; avoiding fast food high in fat; avoiding soft drinks high in sugar; and avoiding foods high in sugar. These behaviours were targeted as they represent key behaviours which reduce individual's risk of obesity and developing weight-related health problems.

Study 3 represents a replication of the findings of Study 2 in an obesity, diet and exercise context. As such, the methodology and aims of Study 3 are identical to those of Study 2. See Chapter 5 for a fuller discussion of the theoretical underpinnings for this project. Study 3 aims to investigate the utility of both PMT-R and TPB for predicting diet and exercise intentions. However, in this study interaction effects were also investigated – including threat by efficacy and injunctive norms by motivation to comply interaction effects; as both the EPPM and PMT-R predict that individuals are most likely to intend to engage in health protective behaviours when their perceptions of both threat and efficacy are high (cf. Rogers, 1983; Witte, 1992a; Witte & Allen, 2000). Ajzen (1991) suggests that subjective norms are a function of two interacting factors: whether the individual believes that important people in their life would approve of them engaging in a behaviour (injunctive norms); and their motivation to comply with these peoples' wishes. The TPB predicts that individuals most likely to intend to engage in a behaviour when their injunctive norms and motivation to comply are both high. In Study 2 only injunctive norms were measured. Therefore, Study 3 addresses this limitation by investigating the effect of both injunctive norms and motivation to comply and their interaction on behavioural intentions.

Study 3 also aims to compare PMT-R and TPB for their accuracy in predicting intentions. The results of Study 2 suggested that the TPB was the best approximating model. However, the predictive power of the TPB was increased following the addition of health knowledge and past behaviour. Study 3 also aims to compare PMT-R and TPB to models which also include health knowledge and past behaviour. Based on the findings of Study 2 it was predicted that the TPB would be a better approximating model for predicting diet and exercise intentions when compared with PMT-R. Further it was predicted that both health knowledge and past behaviour would increase the predictive power of both PMT-R and TPB.

Finally this study aimed to test the predictions of the integrated model from Study 2 (see Chapter 5; Figure 5.1). To recap, participants' attitudes were predicted to be determined by their health knowledge and perceived susceptibility, severity and response-efficacy. Further, attitudes were predicted to fully mediate the effects of these variables on intentions. Self-efficacy was predicted to be determined by perceived controllability, past behaviour and health knowledge. Self-efficacy was also predicted to fully mediate the effects of these variables on intentions. Finally according to the integrated model, predictors of intentions include attitudes, injunctive norms, descriptive norms and self-efficacy. Results from this study are reported in Richards and Johnson (2014; see appendix AE).

Method

Participants

Five hundred and forty-five participants were recruited for the study (78.8% female). The mean BMI of the participants was 24.45 (*SD* = 5.24). Nineteen participants were in the underweight range (BMI < 18.5), 291 were within the normal range (BMI between 18.5 and 24.9), 128 were in the overweight range (BMI between 25 and 29.9) and 61 were in the obese range (BMI > 30). Participants were recruited from an undergraduate psychology program of a university in New South Wales, Australia (84.2%) and the general public. Undergraduate participants were recruited via an online advertisement and received partial course credit for their participation. General public participants were recruited via advertisement posters and were placed in a competition to win an iPod Touch for their participation. Participants mean age was 24.78 (*SD* = 10.32). Forty-five participants were removed from data analysis due to incomplete data leaving exactly 500 participants who completed the study.

Measures

Each of the measures (with the exception of the demographics, health knowledge and prior behaviour measures) used were adapted from those used in previous research. The items were phrased similarly to those used in previous research; but were adapted to match the health behaviours investigated in this research. This research explored predictors of intentions to adopt six health behaviours: minimising intake of foods high in saturated fat, minimising intake of foods high in sugar, avoiding intake of fast food, avoiding the intake of drinks high in sugar and adopting a balanced diet and exercising for 30 minutes a day five days a week. Measures of each of the predictor variables (i.e., attitudes, injunctive and descriptive norms, motivation to comply, perceived controllability, self-efficacy, response-efficacy and intentions) were completed by all participants for each of these health behaviours. However, the same measures of susceptibility and severity were used for all six health behaviours. Unless otherwise indicated all measures utilised a 7-point likert scale anchored by "Strongly disagree" and "Strongly agree". The items from each measure were summed and averaged to yield a mean item score out of seven prior to analysis.

Demographics/past behaviour.

Participants completed a self-report demographics questionnaire. Participant's age, sex, height, weight and current diet and exercise habits were measured. Measures of how often they consumed foods high in fat, ate fast food, foods high in sugar and drank soft drinks high in sugar were used as measures of prior dietary behaviour. Measures of how many exercise sessions participants engaged in per week during the past month and how long these exercise sessions were used to calculate how long each participant had spent exercising per week (in minutes). This was which was used as a measure of prior exercise behaviour.

Theory of Planned Behaviour predictors.

Measures of attitudes, subjective norms and perceived behavioural control are based on previous research (e.g., Chatsizarantis et al., 2006; Hagger et al., 2002a; Jones et al., 2004; Kraft et al., 2005; Nejad, Wertheim & Greenwood, 2006; Payne et al., 2004;

Rivis & Sheeran, 2003) and follow guidelines set out by Martin Fishbein and Icek Ajzen (authors of the TRA and TPB; Fishbein et al., 2010) for the creation of items to measure these constructs. Similar measures have been used extensively in the Theory of Planned Behaviour literature and have generally been found to have high reliability (e.g., Chatzisarantis et al.; Hagger et al.; Kraft et al.; Payne et al.; Jones et al.; Rivis et al.).

Attitudes. Attitudes towards each of the exercise and dietary behaviours were measured using a 4-item semantic-differential scale. Participants indicated the extent to which engaging in each behaviour would be good/bad, enjoyable/not enjoyable, unwise/wise, beneficial/not beneficial during the next month on a 7-point scale. For most of the behaviours the internal consistency was acceptable (αs between .72 and .88), however the internal consistency for "minimising intake of foods high in sugar" was unacceptably low (α = .60). Exploratory analysis revealed that the internal consistency of the attitudes measure for each of the behaviours was increased following the deletion of the enjoyable/not enjoyable item. As such this item was removed from analysis for each of the behaviours. Following removal of this item internal consistency was improved for all health behaviours ranging from .79 to .92.

Normative Influences. Normative influences were measured using a 3-item scale. Two items measured injunctive norms (e.g., "Most people who are important to me would approve if I exercise 30 minutes per day 5 days per week [maintain a healthy diet; minimise my consumption of foods with a high fat content; high in sugar; fast foods, etc.] during the next month"). The final item measured descriptive norms (e.g., "most people who are important to me exercise 30 minutes per day 5 days per week [maintain a healthy diet; avoid food with a high fat content; high in sugar; fast foods, etc.]"). The internal consistency for the overall normative influences measure was unacceptably low for each of the behaviours investigated (αs between .50 and .61). Following the removal of the descriptive norms item, the resultant 2-item injunctive norms measure was found to have acceptable internal consistency for minimising intake of foods high in fat (α =.70). However, the injunctive norms measure still failed to reach conventional levels of acceptability for exercising 30 minutes per day 5 days per week (α =.65), adopting a healthy diet (α =.62), minimising intake of fast food (α =.63), minimising intake of soft drinks (α =.62) and minimising intake of foods high in sugar (α =.62). As such, results pertaining directly to these measures should be interpreted with caution.

Motivation to Comply. Within the TPB subjective norms are operationalized as normative beliefs * motivation to comply. As such, a motivation to comply measure was created to investigate whether it moderates the effect of normative beliefs on intentions. The three item measure (e.g., “When it comes to matters of my health, I want to do what people who are important to me want me to do”) was found to have good internal consistency (α =.87).

Perceived Controllability. Perceived controllability was measured using a 2-item scale. Participants indicated the extent to which they believe they have volitional control over whether they engage in each behaviour during the next month (e.g., “I have complete control over whether I exercise 30 minutes per day 5 days per week [maintain a healthy diet; avoid food with a high fat content; high in sugar; fast foods etc.] during the next month”). The internal consistency for this measure was acceptable for most of the dietary behaviours investigated (αs ranged between .72 and .82). However, minimising intake of soft drink (α =.65) failed to reach conventional levels of acceptability for internal consistency.

Protection Motivation Theory predictors.

Measures of threat, severity, susceptibility, efficacy, self-efficacy, response-efficacy and intentions have been purposefully designed for this experiment and follow guidelines from previous research (e.g., Witte, 1992a, 1994; Cho, 2003; Cho et al., 2006; Witte et al., 1996) and an item bank created by Kim Witte (author of the EPPM; Witte, n.d.) for use in fear appeal research. However, items have been applied to the health context of interest for this research (i.e., obesity, diet and exercise). Similar measures have been used extensively in the fear appeal literature, have demonstrated construct validity and have generally been found to have high reliability (e.g., Cho, 2003, 2006; Witte, 1992b, 1994; Witte et al.).

Susceptibility. Susceptibility was measured using a 3-item scale. Participants indicated the extent to which they believed they were at risk of the adverse health effects associated with their weight (e.g., “It is possible that I will develop adverse health effects because of my weight”). The internal consistency of this scale was high ($\alpha = .96$).

Severity. Severity was measured using a 3-item scale. Participants indicated the extent to which they believed the adverse health effects associated with poor diet and exercise are severe and significant (e.g., “The health effects of overweight and obesity are severe”). The internal consistency of this scale was acceptable ($\alpha = .77$).

Self-Efficacy. Self-efficacy was measured using a 6-item scale. Participants indicated the extent to which they believe they are capable of engaging in particular exercise and dietary behaviours during the next month (e.g., “I am certain that I could avoid food with a high fat content [high in sugar, fast foods etc.] during the next month.”). The internal consistency for this measure was high for each of the behaviours investigated (α’s ranged between .84 and .93).

Response-efficacy. Response-efficacy was measured using a 3-item scale. Participants indicated the extent to which they believe that engaging in particular diet and exercise behaviours will prevent weight-related health problems (e.g., “Avoiding food with a high fat content [high in sugar, fast foods etc.] is effective in preventing weight-related health problems.”). The internal consistency for this measure was acceptable or high for each of the behaviours investigated (α’s ranged between .72 and .83).

Intentions.

The dependant variable, intentions, was measured using a 2-item scale. Participants indicated to what extent they intended to engage in each of the dietary and exercise behaviours during the next month (e.g., “I intend to avoid food with a high fat content [high in sugar, fast foods etc.] during the next month.”). The internal consistency for this measure was high for each of the behaviours investigated (α’s ranged between .87 and .96).

Health knowledge.

The Health Knowledge Questionnaire (HKQ) measured participants’ level of health knowledge relevant to obesity, diet and exercise. The HKQ was subdivided into a six-item efficacy health knowledge scale (e.g., To achieve weight loss an individual should reduce _______________ improve ___________ and increase ______________”; correct responses calorie/kilojoule/energy/food, diet and exercise/physical activity respectively) and a single item threat health knowledge scale (“Please list the adverse health effects associated with obesity” correct responses included but were not limited to: stroke, hypertension, Type 2 Diabetes, breathing problems, high cholesterol, coronary heart disease, fatigue and lower back pain). Each correct response was awarded one point.

The internal consistency for the efficacy health knowledge measure was acceptable (α = .71).

Procedure

Participants completed the experiment online via a website placed on the university server. Participants were told that the experiment was investigating the effect of the media on health behaviour. They firstly completed the demographics and past behaviour measures. This was followed by measures of susceptibility, severity, response-efficacy, self-efficacy, attitudes, injunctive/descriptive norms, motivation to comply and perceived controllability. To limit response bias due to the order of items these items were presented in random order. Following these items, participants were presented with the measures of intentions and health knowledge. At the completion of the experiment participants were given the option to continue their participation into a second part of this study (results to be described in Chapter 7). If they did not choose to continue their participation they were fully debriefed and informed of the true nature of the project.

Data Analysis

Principle components analyses with Varimax rotation were utilised to ensure that injunctive and descriptive norms represented distinct constructs. Similar analyses were performed for self-efficacy and perceived controllability. Pearson correlations were utilised to investigate the bivariate effects between predictors and outcome variables. Hierarchical multiple linear regression analyses were utilised to investigate the predictions of PMT-R and the TPB. Akaike Information Criterion (corrected; AICc) values were utilised to compare these models (Burnham & Anderson, 2002, 2003). Finally, path analyses were utilised to test the predictions of the proposed integrated model. Mediational hypotheses were tested using bootstrapped point estimates (with 95% confidence intervals) for the indirect effects (cf. Preacher & Hayes, 2004, 2008).

Results

Principle Components Analysis

Injunctive and descriptive norms.

Principle components analyses with Varimax rotation were performed on the normative influences items to ascertain whether they represented more than one factor. For each of the behaviours a two factor solution was found whereby the injunctive norms items loaded on factor 1 (factor loadings > .50; Kline, 1994; eigenvalues between 1.35 and 1.54; variance explained between 44.87% and 51.28%) and the descriptive norms item loaded on factor 2 (eigenvalues between 1.01 and 1.03; variance explained between 33.60% and 34.32%). The two factor solutions explained between 78.47% and 84.91% of the variance. As such, the items measuring injunctive norms and descriptive norms were separated and used as independent predictors of intentions in the analyses.

Self-efficacy/perceived controllability.

As self-efficacy and PBC are conceptually similar there was a need to ensure that the items used to measure these constructs indeed represented two separate constructs rather than a single overarching construct. Therefore a principal components analysis (with Varimax rotation) was performed on the PBC and self-efficacy items for each of the health behaviours investigated. For four of the health behaviours (exercise 30 mins per day 5 days per week, avoiding foods high in fat, avoiding fast food and avoiding foods high in sugar) factor loadings were as expected, with the six self-efficacy items clearly loading on the first factor (factor loadings > .50; Kline, 1994; eigenvalues between 3.27 and 4.16; variance explained between 40.91% and 52.02%) and the two PBC items clearly loading on the second factor (eigenvalues between 1.77 and 2.18; additional variance explained between 22.08% and 27.22%). However, for the remaining two health behaviours (adopting a healthy diet and avoiding soft drink) there was a self-efficacy item which loaded on both factor 1 and factor 2. These items ("I am able to adopt a diet which includes an appropriate balance of the 5 major food groups during the next month" and "If I wanted to I could easily minimise my consumption of soft drink during the next month") were therefore removed from analysis. Following their removal the principle components analyses were re-run and the items loaded on the factors as expected. Factor 1 explained 39.10% of the variance for adopting a healthy diet (eigenvalue = 2.74) and 36.49% for minimising consumption of soft drinks high in sugar (eigenvalue = 2.55). Factor 2 explained an additional 29.42% (eigenvalue = 2.06) and 26.17% (eigenvalue = 1.83) for healthy diet and soft drink respectively. These findings suggest that self-efficacy and perceived controllability are distinct constructs.

Correlations between outcome and predictor variables.

Pearson correlations were calculated between each of the predictor variables from PMT-R and the TPB (including interaction effects), in addition to threat and efficacy health knowledge and past behaviour. Separate sets of correlation coefficients were calculated for each of the six health behaviours investigated. The past behaviour measures presented in the demographics questions differed for each of the health behaviours investigated. For exercising 30 minutes per day 5 days per week self-reported time spent exercising per week was used as a measure of past behaviour. As maintaining a healthy diet is not a specific behaviour but requires adoption of a number of behaviours four measures of past behaviour were utilised. These represented the four unhealthy eating habits which were studied in this experiment. Therefore, the past behaviour measures for maintaining a healthy diet included past intake of: foods high in fat; fast food high in fat; soft drink high in sugar and foods high in sugar. For the remaining four health behaviours only the corresponding past health behaviour was utilised as a measure of past behaviour (i.e., past intake of fast food for avoiding fast food). Power to find a small effect size (r = .10) was approximately .60. However, power to find a small to medium effect size (r = .15) exceeded .90 and power to find a medium effect size (r = .30) exceeded .99.

Exercise 30 mins.

Intentions to exercise 30 minutes per day 5 days per week was found to be positively associated with attitudes, injunctive norms, perceived controllability, self-efficacy, descriptive norms, response-efficacy and previous exercise behaviour (see table 6.1). Contrary to the predictions only one of the interaction terms (severity * self-efficacy) was found to be a significant predictor of intentions. As predicted by the integrated model, attitudes were found to be associated with severity and response-efficacy. However, no significant association between attitudes and susceptibility was found. A strong positive correlation was found between self-efficacy and perceived controllability; self-efficacy was also positively associated with past exercise behaviour. Both threat and efficacy health knowledge were positively associated with severity and response-efficacy. However, contrary to predictions these variables were uncorrelated with susceptibility or self-efficacy.

Healthy diet.

Self-efficacy was found to be strongly associated with intentions to maintain a healthy diet (r = .53, p < .001). Moderate positive associations were found for attitudes, perceived controllability and descriptive norms, and weak positive associations were found for injunctive norms, severity, response-efficacy, the severity * response-efficacy interaction term and threat and efficacy health knowledge. Intentions were also

Table 6.1

Correlation Matrix for Intentions to Exercise 30 Minutes per day 5 days per week and all Measured Predictors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Intentions																	
2. Attitudes	.33**																
3. Injunctive norms	.30**	.37**															
4. Perceived controllability	.32**	.29**	.30**														
5. Self-efficacy	.68**	.33**	.32**	.53**													
6. Motivation to comply	.06	-.01	.24**	-.03	.00												
7. IN*MTC	.02	.05	-.08	.07	-.01	.11*											
8. Descriptive norms	.24**	.07	.23**	.11*	.28**	.28**	-.01										
9. Susceptibility	.00	-.03	.12**	-.19**	-.20**	.06	.10*	-.03									
10. Severity	.07	.14**	.21**	.04	.05	.03	-.06	.06	.24**								
11. Response-efficacy	.14**	.31**	.36**	.38**	.23**	.05	.00	-.01	.00	.26**							
12. Susc*SE	.01	-.01	-.01	.05	-.06	.03	-.08	.05	-.09	-.02	-.03						
13. Susc*RE	.01	.02	.02	.00	-.03	-.01	.02	-.03	.07	.05	-.02	.23**					
14. Sev*SE	.14**	.01	.03	.10*	.07	.01	-.07	.07	-.02	.09	.04	.23**	-.04				
15. Sev*RE	.09	-.07	.02	-.05	.03	-.03	-.06	.08	.04	-.12**	-.18**	.01	.12**	.16**			
16. Efficacy HK	-.03	.04	.00	.01	-.05	-.06	-.02	-.08	.02	.11**	.15**	-.02	.05	-.02	.00		
17. Threat HK	.04	.06	.08	.07	.05	-.10*	.00	-.08	.01	.15**	.21**	.01	.06	-.02	-.02	.53**	
18. Exercise PW	.38**	.11*	.01	.19**	.41**	-.06	-.01	.19**	-.13**	.08	.06	-.03	-.10	.12**	.08	-.01	.00

Note: IN*MTC = injunctive norms * motivation to comply, Susc*SE = susceptibility * self-efficacy, Susc*RE = susceptibility * response-efficacy, Sev*SE = severity * self-efficacy, Sev*RE = severity * response-efficacy, HK = health knowledge, Exercise PW = minutes of exercise per week. * = $p < .05$; ** = $p < .01$.

negatively associated with all four of the past behaviour measures. The four past behaviour measures were positively correlated (*r*s between .24 and .53; all *p*s < .001). Indicating that individuals who engage in one unhealthy dietary behaviour are more likely to engage in other unhealthy dietary behaviours. Attitudes were found to be positively associated with severity, response-efficacy and threat and efficacy health knowledge. Self-efficacy was found to be strongly associated with perceived controllability; it was also negatively associated with all four of the health behaviour measures. Threat and efficacy health knowledge were found to be positively associated with attitudes, self-efficacy, perceived severity and response-efficacy. Efficacy health knowledge was also found to be negatively associated with the susceptibility * self-efficacy interaction term (see table 6.2).

Avoid foods high in fat.

Intentions to avoid foods high in fat were found to be strongly associated with self-efficacy. Moderate positive associations were found between intentions and both attitudes and perceived controllability. Weak correlations were found for injunctive norms, the injunctive norms * motivation to comply interaction term (IN*MTC), descriptive norms, severity, response-efficacy and threat and efficacy health knowledge. Prior fatty food intake was negatively associated with intentions to avoid fatty foods. As predicted, self-efficacy was strongly associated with perceived controllability. A moderate negative association was also found between self-efficacy and prior intake of foods high in fat. As predicted, attitudes were found to be positively associated with susceptibility, severity and response-efficacy. However, attitudes were negatively associated with the severity * response-efficacy interaction term. Threat and efficacy health knowledge were both positively associated with attitudes, self-efficacy, severity and response-efficacy (see table 6.3).

Table 6.2

Correlation Matrix for Intentions to Maintain a Healthy Diet and all Measured Predictors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Intentions																				
2. Attitudes	.34**																			
3. Injunctive norms	.24**	.25**																		
4. Perceived controllability	.37**	.22**	.26**																	
5. Self-efficacy	.53**	.26**	.16**	.55**																
6. Motivation to comply	.07	.01	.21**	-.07	-.08															
7. IN*MTC	.06	-.01	-.15**	.06	.03	.11*														
8. Descriptive norms	.31**	.09*	.33**	.18**	.27**	.25**	-.06													
9. Susceptibility	.02	-.02	.08	-.09*	-.20**	.06	.05	-.09												
10. Severity	.11**	.12**	.21**	.11*	.07	.03	-.08	.11*	.24**											
11. Response-efficacy	.26**	.33**	.43**	.55**	.33**	.00	.06	.17**	-.05	.22**										
12. Susc*SE	-.03	.00	.00	-.02	-.01	-.04	-.08	-.07	-.05	.00	-.03									
13. Susc*RE	-.02	.09*	.03	-.02	-.03	.02	.05	.00	.06	.09	-.03	.29**								
14. Sev*SE	.04	.00	.04	.07	.02	.01	-.09*	.02	.00	.05	.04	.25**	-.12**							
15. Sev*RE	.09*	-.03	-.03	-.05	.04	.02	-.02	.05	.09	.02	-.09	-.08	.02	.27**						
16. Efficacy HK	.11*	.16**	.12**	.07	.12**	.06	-.02	.00	.02	.11*	.14**	-.10*	.02	-.05	-.05					
17. Threat HK	.14**	.17**	.09*	.16**	.14**	-.10*	-.02	.00	.01	.15**	.21**	-.06	-.01	-.04	.00	.53**				
18. High fat	-.18**	-.17**	-.06	-.13**	-.19**	-.01	.02	-.06	.10**	.05	-.07	.07	-.08	-.06	-.13**	-.03	-.01			
19. Fast food	-.21**	-.09	.03	-.22**	-.37**	.09	-.03	-.18**	.14**	-.11*	-.13**	.02	.00	.01	.00	-.17**	-.16**	.24**		
20. Soft drink	-.16**	-.12**	.01	-.11**	-.22**	.03	-.06	-.07	.12**	-.10*	-.11*	.03	-.02	.04	.06	-.15**	-.09*	.30**	.44**	
21. High sugar	-.14**	-.13**	.00	-.04	-.16**	.06	.11*	.03	.06	.03	.03	.04	.08	-.05	-.07	-.07	-.09*	.53**	.30**	.35**

Note: IN*MTC = injunctive norms * motivation to comply, Susc*SE = susceptibility * self-efficacy, Susc*RE = susceptibility * response-efficacy, Sev*SE = severity * self-efficacy, Sev*RE = severity * response-efficacy, HK = health knowledge, 18-21 represent measures of past behaviour (i.e., how often food high in fat are consumed per week). * = p < .05; ** = p < .01.

Table 6.3

Correlation Matrix for Intentions to Avoid Foods High in Fat and all Measured Predictors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Intentions																	
2. Attitudes	.43**																
3. Injunctive norms	.26**	.26**															
4. Perceived controllability	.33**	.30**	.22**														
5. Self-efficacy	.54**	.30**	.14**	.50**													
6. Motivation to comply	.07	-.04	.23**	-.12*	-.06												
7. IN*MTC	.10*	.09*	-.06	.05	.08	.12**											
8. Descriptive norms	.15**	.01	.23**	.10*	.21**	.23**	-.06										
9. Susceptibility	.03	-.04	.18**	-.18**	-.17**	.06	.02	-.12**									
10. Severity	.15**	.18**	.28**	.08	.07	.03	-.07	.09*	.24**								
11. Response-efficacy	.28**	.35**	.37**	.43**	.25**	.03	.01	.12**	-.03	.25**							
12. Susc*SE	-.04	-.01	.03	.08	-.04	-.10*	-.05	-.05	.00	-.01	.06						
13. Susc*RE	-.07	.08	.07	.03	.06	.04	.07	-.03	.01	.07	.02	.32**					
14. Sev*SE	-.01	-.03	.06	.02	.03	.04	-.15**	.07	-.01	.09*	.04	.26**	-.13**				
15. Sev*RE	.03	-.12**	-.09*	-.09*	.04	.01	.04	.07	.06	-.13**	-.15**	-.08	.07	.17**			
16. Efficacy HK	.13**	.12**	.04	.11*	.11*	-.06	-.03	-.04	.02	.11*	.12**	-.03	.02	-.03	-.05		
17. Threat HK	.17**	.12**	.04	.18**	.13**	-.10*	.00	-.05	.01	.15**	.16**	-.05	.02	-.04	-.04	.53**	
18. High fat	-.27**	-.27**	-.05	-.13**	-.36**	-.01	-.06	-.11*	.10*	.05	-.08	-.04	-.04	-.06	-.09	-.03	-.01

Note: IN*MTC = injunctive norms * motivation to comply, Susc*SE = susceptibility * self-efficacy, Susc*RE = susceptibility * response-efficacy, Sev*SE = severity * self-efficacy, Sev*RE = severity * response-efficacy, HK = health knowledge. * = $p < .05$; ** = $p < .01$.

Avoid fast food.

Intentions to avoid fast food high in fat were positively associated with attitudes, injunctive norms, perceived controllability, self-efficacy, descriptive norms, severity, response-efficacy and threat and efficacy health knowledge. Prior fast food intake was negatively associated with intentions. Attitudes were found to be positively associated with severity and response-efficacy, but were uncorrelated with susceptibility. Self-efficacy was strongly associated with both perceived controllability(r = .57, p < .001) and prior fast food intake (r = -.52, p < .001). As predicted, both threat and efficacy health knowledge were positively associated with attitudes, self-efficacy, severity and response-efficacy. However, neither variable was associated with susceptibility (see table 6.4).

Avoid soft drink.

Self-efficacy was found to be strongly associated with intentions to avoid soft drinks high in sugar. Moderate associations were found for attitudes, perceived controllability, and prior soft drink intake (negative association); and weak associations were found for injunctive and descriptive norms, severity, response-efficacy and threat and efficacy health knowledge. Contrary to predictions none of the interaction terms were associated with intentions. As predicted, attitudes were found to be positively associated with severity and response-efficacy. Also as predicted, self-efficacy was found to be positively associated with perceived controllability and negatively associated with prior soft drink intake. Both threat and efficacy health knowledge were positively associated with attitudes, self-efficacy and severity. Threat health knowledge was also associated with response-efficacy (see table 6.5).

Table 6.4

Correlation Matrix for Intentions to Avoid Fast Foods High in Fat and all Measured Predictors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Intentions																	
2. Attitudes	.41**																
3. Injunctive norms	.13**	.16**															
4. Perceived controllability	.38**	.29**	.18**														
5. Self-efficacy	.55**	.29**	-.02	.57**													
6. Motivation to comply	.01	-.01	.28**	-.06	-.12**												
7. IN*MTC	.06	.04	-.08	.06	.11*	.20**											
8. Descriptive norms	.21**	.07	.21**	.20**	.18**	.17**	-.02										
9. Susceptibility	.00	-.01	.20**	-.13**	-.21**	.06	-.06	-.08									
10. Severity	.13**	.17**	.19**	.10*	.09*	.03	-.06	.15**	.24**								
11. Response-efficacy	.36**	.38**	.37**	.48**	.35**	.02	.04	.14**	.00	.28**							
12. Susc*SE	-.06	-.05	.05	.06	.04	-.02	-.11*	.00	-.02	-.02	-.02						
13. Susc*RE	-.03	.01	.06	-.08	-.02	.00	.03	.05	.07	.03	-.08	.30**					
14. Sev*SE	-.04	-.14**	.05	.01	-.02	.05	-.08	.08	-.02	.10*	-.04	.25**	-.15**				
15. Sev*RE	-.04	-.15**	-.08	-.01	-.04	-.03	.01	.01	.03	-.13**	-.24**	-.09	.15	.34**			
16. Efficacy HK	.18**	.13**	-.01	.11*	.14**	-.06	-.03	-.03	.02	.11*	.14**	-.04	.04	-.03	-.05		
17. Threat HK	.22**	.17**	.00	.13**	.16**	-.10*	-.06	.01	.01	.15**	.20**	-.06	.02	-.05	-.05	.53**	
18. Fast food	-.36**	-.12**	.15**	-.27**	-.52**	.09	-.02	-.16**	.14**	-.11*	-.11*	.02	.00	.04	.01	-.17**	-.16**

Note: IN*MTC = injunctive norms * motivation to comply, Susc*SE = susceptibility * self-efficacy, Susc*RE = susceptibility * response-efficacy, Sev*SE = severity * self-efficacy, Sev*RE = severity * response-efficacy, HK = health knowledge. * = $p < .05$; ** = $p < .01$.

Table 6.5

Correlation Matrix for Intentions to Avoid Soft Drinks High in Sugar and all Measured Predictors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Intentions																	
2. Attitudes	.43**																
3. Injunctive norms	.12**	.12**															
4. Perceived controllability	.38**	.31**	.09*														
5. Self-efficacy	.50**	.35**	-.08	.51**													
6. Motivation to comply	.06	.02	.28**	-.02	-.10*												
7. IN*MTC	.01	.05	-.06	.06	.05	.13**											
8. Descriptive norms	.16**	.05	.26**	.06	.15**	.19**	.04										
9. Susceptibility	.01	.00	.16**	-.08	-.16**	.06	.06	-.03									
10. Severity	.13**	.17**	.15**	.12**	.08	.03	.02	.10*	.24**								
11. Response-efficacy	.29**	.33**	.35**	.34**	.27**	.06	-.01	.14**	.00	.26**							
12. Susc*SE	.04	-.01	.00	.03	.04	.00	-.10*	-.05	-.03	-.01	.04						
13. Susc*RE	.05	-.01	.06	.05	.04	.02	.05	.06	.05	.00	.03	.27**					
14. Sev*SE	.04	-.03	.08	-.03	-.02	.06	-.08	.06	-.01	.11*	.13**	.25**	-.11*				
15. Sev*RE	.04	.15**	-.06	.11*	.10*	-.04	.11*	.05	.00	-.11**	-.11*	-.06	.24**	.15**			
16. Efficacy HK	.18**	.17**	-.06	.19**	.21**	-.06	.00	-.01	.02	.11*	.06	.00	.02	-.05	-.02		
17. Threat HK	.18**	-.15**	-.01	.17**	.20**	-.10*	-.01	.03	.01	.15**	.18**	-.05	.04	-.03	.01	.53**	
18. Soft drink	-.37**	-.12**	.14**	-.22**	-.48**	.03	-.06	-.08	.12**	-.10*	-.07	-.07	.00	.05	.00	-.15**	-.09*

Note: IN*MTC = injunctive norms * motivation to comply, Susc*SE = susceptibility * self-efficacy, Susc*RE = susceptibility * response-efficacy, Sev*SE = severity * self-efficacy, Sev*RE = severity * response-efficacy, HK = health knowledge. * = $p < .05$; ** = $p < .01$.

Avoid foods high in sugar.

Intentions to avoid foods high in sugar were found to be strongly associated with self-efficacy. Moderate positive associations were found between intentions and attitudes, perceived controllability and response efficacy. Weak correlations were found for injunctive and descriptive norms, severity and threat and efficacy health knowledge. Prior intake of foods high in sugar was negatively associated with intentions. As predicted, attitudes were found to be positively associated with severity and response-efficacy. However, attitudes were uncorrelated with susceptibility. As predicted, self-efficacy was positively associated with perceived controllability and negatively associated with prior intake of foods high in sugar. Threat and efficacy health knowledge were both positively associated with attitudes, severity and response-efficacy. Threat health knowledge was also positively associated with self-efficacy (see table 6.6).

Hierarchical Regression Analyses Investigating the Predictions of PMT-R and TPB.

Hierarchical regression analyses were utilised to test the predictions of the PMT-R and TPB for each of the six health behaviours investigated (tables 6.7 and 6.8 summarise the results of these analyses). In contrast to Study 2, interaction effects predicted by these models were also investigated. Susceptibility * self-efficacy, susceptibility * response-efficacy, severity * self-efficacy, severity * response-efficacy and injunctive norms * motivation to comply interaction terms were calculated. However, susceptibility and self-efficacy are likely to correlate highly with their product (the same will be true for the other interaction terms; Howell, 2002). This will lead to significant multicollinearity, drastically affecting the magnitude of the main effects in regression

Table 6.6

Correlation Matrix for Intentions to Avoid Foods High in Sugar and all Measured Predictors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Intentions																	
2. Attitudes	.41**																
3. Injunctive norms	.15**	.16**															
4. Perceived controllability	.37**	.29**	.23**														
5. Self-efficacy	.52**	.21**	-.02	.48**													
6. Motivation to comply	.07	-.02	.22**	-.03	-.02												
7. IN*MTC	.07	.05	-.08	.08	.02	.14**											
8. Descriptive norms	.16**	.05	.23**	.15**	.17**	.20**	-.07										
9. Susceptibility	.07	.02	.23**	-.15**	-.16**	.06	.00	-.01									
10. Severity	.15**	.18**	.23**	.10*	.06	.03	-.07	.10*	.24**								
11. Response-efficacy	.32**	.40**	.38**	.49**	.28**	.05	.03	.14**	.04	.29**							
12. Susc*SE	-.02	-.01	.03	.09*	-.04	-.08	-.06	-.06	.03	.00	-.01						
13. Susc*RE	.00	-.01	.06	-.02	-.01	.01	.04	.02	.10*	.04	-.08	.29**					
14. Sev*SE	.00	.01	.06	.05	.05	-.03	-.11*	.07	.00	.13**	.07	.26**	-.15*				
15. Sev*RE	.04	-.08	-.06	-.06	.06	-.02	.02	.07	.04	-.08	-.19**	-.08	.18**	.16**			
16. Efficacy HK	.14**	.15**	.00	.09*	.07	-.06	-.02	.01	.02	.11*	.19**	-.03	.03	-.04	-.01		
17. Threat HK	.19**	.17**	.05	.14**	.09*	-.10*	-.08	.02	.01	.15**	.19**	-.03	-.01	-.02	-.06	.53**	
18. High sugar	-.24**	-.13**	.03	-.06	-.28**	.06	.07	.01	.06	.03	.02	.06	.11*	-.03	-.04	-.07	-.09*

Note: IN*MTC = injunctive norms * motivation to comply, Susc*SE = susceptibility * self-efficacy, Susc*RE = susceptibility * response-efficacy, Sev*SE = severity * self-efficacy, Sev*RE = severity * response-efficacy, HK = health knowledge. * = $p < .05$; ** = $p < .01$.

analyses. To avoid this, variables included in the interaction terms were centred prior to analysis (Aiken & West, 1991; Dawson, 2013; Howell). Variables were centred by subtracting the variable's mean from each of the observations, resulting in a variable with a mean of 0. This does not affect the main effects (or bivariate correlations), but does ensure that the bivariate correlation between the interaction terms and their constituent variables are less strongly correlated (Howell). As a result, the regression model is much less affected by multicollinearity between main effect and interaction terms. Centred variables included susceptibility, severity, self-efficacy, response-efficacy, injunctive norms and motivation to comply. All other variables were not corrected in any way.

Applying PMT-R to the prediction of intentions to exercise 30 minutes per day five days per week, maintain a healthy diet, avoid foods high in fat, avoid fast food, avoid soft drinks and avoid foods high in sugar.

Hierarchical regression analyses were utilised to test the predictions of PMT-R. Analyses were structured similarly for each of the six health behaviours investigated. Block 1 contained each of the PMT-R predictors (i.e., severity, susceptibility, self- and response-efficacy). Block 2 contained each of the threat * efficacy interaction terms (centred; i.e., susceptibility * self-efficacy, susceptibility * response-efficacy, severity * self-efficacy, severity * response-efficacy; cf. Plotnikoff, Rhodes et al., 2009). Block 3 consisted both threat and efficacy health knowledge and block 4 contained past behaviour. The predictors in blocks 1 – 3 were identical for each of the health behaviours. However, only the past behaviour measures which corresponded to the health behaviour being investigated were used as predictors in block 4 (i.e., past exercise behaviour used as a predictor of intentions to exercise for 30 mins per day 5 days per week etc.). Akaike Information Criterion (corrected) values and Akaike weights were calculated for each of the regression models and utilised to determine the relative strength of each of these models (cf. Burnham & Anderson, 2002; 2004; Wagenmakers et al., 2004). Previous research investigating PMT-R have generally found medium to large effect sizes (f^2s between .25 and 1.27; e.g., Bui et al., 2013; Hodgkins et al., 1998; Maddux et al., 1983; Melamed et al.,, 1996; Plotnikoff et al., 1995, 1998, 2002; Plotnikoff, Rhodes et al.; Plotnikoff, Trinh, et al., 2009; Rogers et al., 1976; Stanley et al., 1986; Van der Velde, et al., 1991). Power to find a small effect size (f^2 = .02) exceeded .90 for all analyses, indicating that power was more than adequate.

Exercise 30 mins. Hierarchical regression analyses revealed a significant model of intentions to exercise for 30 minutes per day 5 days per week during the next month ($F(11,486) = 45.85$, $p < .001$, $R^2_{Adj} = .50$, $f^2 = .99$; see table 6.7). The PMT-R variables explained 48.19% of the variance in intentions ($F(4,493) = 116.59$, $p < .001$, $AICc = 309.40$). Only susceptibility and self-efficacy were significant predictors. The addition of the threat * efficacy interaction variables in block 2 explained a further 0.82% of the variance in intentions ($\Delta F(4,489) = 2.98$, $p < .05$, $AICc = 305.61$). However, only the severity * self-efficacy interaction term was a significant predictor. Threat and efficacy health knowledge did not contribute further variance to the model ($\Delta F(2,487) = .06$, $p = .94$, $AICc = 309.64$). Past exercise behaviour explained a further 0.99% of the variance ($\Delta F(1,486) = 10.66$, $p < .005$, $AICc = 300.93$).

Bivariate relationships between susceptibility and intentions were non-significant ($r < .01$, $p = .98$), but susceptibility was negatively associated with self-efficacy ($r = -.20$, $p < .001$). Further, the standardised regression coefficient for self-efficacy ($\beta = .72$) exceeded its bivariate correlation with intentions ($r = .68$). This indicates that susceptibility most likely acted as a suppressor variable, suppressing irrelevant variance in self-efficacy (i.e., classical suppression; cf. Pandey et al., 2010;

Table 6.7

Results of Hierarchical Regression Analysis Investigating the Predictions of PMT-R for each of the Six Health Behaviours Investigated

		Exercise 30 Mins		Healthy Diet		Avoid Fat		Avoid Fast Food		Avoid Soft Drink		Avoid Sugar	
	Predictor	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}
Step 1:	Susceptibility	.14****	.48****	.11***	.32****	.11***	.32****	.11**	.34****	.08*	.28****	.13****	.32****
	Severity	.01		.04		.04		.01		.03		.04	
	Response-efficacy	-.02		.14****		.14****		.19****		.16****		.17****	
	Self-efficacy	.72****		.52****		.52****		.51****		.47****		.49****	
Step 2:	Susceptibility	.14****	.49*	.11**	.32	.11**	.32	.11**	.34	.08*	.27	.13***	.31
	Severity	.01		.05		.05		.01		.03		.05	
	Response-efficacy	-.01		.15****		.15****		.19****		.15****		.18****	
	Self-efficacy	.71****		.51****		.51****		.51****		.47****		.48****	
	Susc*RE	.00		-.03		-.03		-.07		.00		.03	
	Susc*SE	.04		.04		.04		.00		.03		-.03	
	Sev*RE	.04		-.03		-.03		.00		.03		-.07	
	Sev*SE	.08*		.03		.03		.01		.00		.06	
Step 3:	Susceptibility	.14****	.49	.11**	.32	.11**	.32	.10**	.35*	.08	.28	.13***	.32*
	Severity	.01		.04		.04		.00		.02		.04	
	Response-efficacy	-.02		.14		.14****		.17****		.15****		.17****	
	Self-efficacy	.71****		.51****		.51****		.50****		.45****		.48	
	Susc*RE	.00		-.03		-.03		-.06		.01		.03	
	Susc*SE	.04		.04		.03		.00		.03		-.03	
	Sev*RE	.04		-.02		-.02		.00		.03		-.06	
	Sev*SE	.08*		.03		.03		.02		.00		.06	
	Efficacy HK	.00		.02		.02		.04		.05		.01	
	Threat HK	.01		.06		.06		.08		.03		.10*	

Table 6.7 continued

	Predictor	Exercise 30 Mins		Healthy Diet		Avoid Fat		Avoid Fast Food		Avoid Soft Drink		Avoid Sugar	
		β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}
Step 4:	Susceptibility	.15****	.50***	.11**	.33*	.11**	.33*	.11**	.35*	.09*	.30****	.13***	.34***
	Severity	-.01		.05		.05		-.01		.00		.04	
	Response-efficacy	-.09		.14****		.14****		.19****		.17****		.18****	
	Self-efficacy	.66****		.47****		.47****		.44****		.37****		.44****	
	Susc*RE	.01		-.03		-.03		-.06		-.01		.03	
	Susc*SE	.04		.03		.03		.00		.03		-.01	
	Sev*RE	.03		-.03		-.03		.00		.04		-.06	
	Sev*SE	.07		.03		.03		.01		.01		.06	
	Efficacy HK	-.01		.02		.02		.03		.04		.01	
	Threat HK	.02		.06		.06		.07		.04		.10*	
	Past behaviour$_1$												
	Exercise	.12***											
	Fatty Foods			-.10*		-.10*							
	Fast Food			.02				-.11*					
	Soft Drink			-.01						-.18****			
	Sugary Food			-.03								-.12***	

Note. PBC = Perceived behavioural control, Susc*RE = susceptibility*response-efficacy, Susc*SE = susceptibility*self-efficacy, Sev*RE = severity*response-efficacy, Sev*SE = severity*self-efficacy, HK = health knowledge, $_1$ = multiple measures of past behaviour, * = p < .05, ** = p <.01, *** = p <.005, **** = p < .001.

Tzelgov et al., 1991). The Preacher et al. (2008) bootstrapping method was used to test this effect (see Chapter 5). The 95% confidence interval for the difference in the predictive validity of self-efficacy as a result of the inclusion of susceptibility in the model did not contain zero (M = -.03, SE = .01, 95% C.I. = -.06 – -.02). This indicates that susceptibility acted as a suppressor variable within the regression equation.

To explore the moderating effect of self-efficacy on severity, interaction analyses were conducted using the regression equation obtained from blocks 1 and 2. Following recommendations from Aiken & West (1991; see also Dawson, 2013) the relationship between severity and intentions was examined under conditions where self-efficacy was low (-1 SD) and high (+1 SD). Other variables in the regression equation had all been centred so should not affect interpretation of the interaction. These variables can be thought of as control variables for the purposes of the interaction analysis (cf. Dawson). As can be seen in figure 6.1, when self-efficacy is low, severity was negatively associated with intentions, however when self-efficacy was high the relationship was positive. Simple slope analysis revealed that the slope was significant when self-efficacy was high (gradient = .12, t = 2.01, p < .05) but was not when self-efficacy was low (gradient = -.10, t = 1.70, p = .09). This suggests that severity is positively associated with intentions at high levels of self-efficacy but is not associated at low levels of self-efficacy. ***Healthy Diet.*** The PMT-R variables were found to explain 29.94% of the variance in intentions to maintain a healthy diet during the next month (F(4,493) = 54.10, p < .001, $AICc$ = 205.94). Susceptibility, response-efficacy and self-efficacy each emerged as significant predictors. The threat*efficacy interaction terms (ΔF(4,489) = .93, p = .45, $AICc$ = 210.39), health knowledge variables (ΔF(2,487) = .79, p = .46, $AICc$ = 212.94) and past behaviour variables (ΔF(4,483) = 1.58, p = .19, $AICc$ = 215.01) all did not contribute significant unique variance to the model. The final model explained 30.17% of the variance in intentions (F(14,483) = 16.34, p < .001) a large effect size (f^2 = .43).

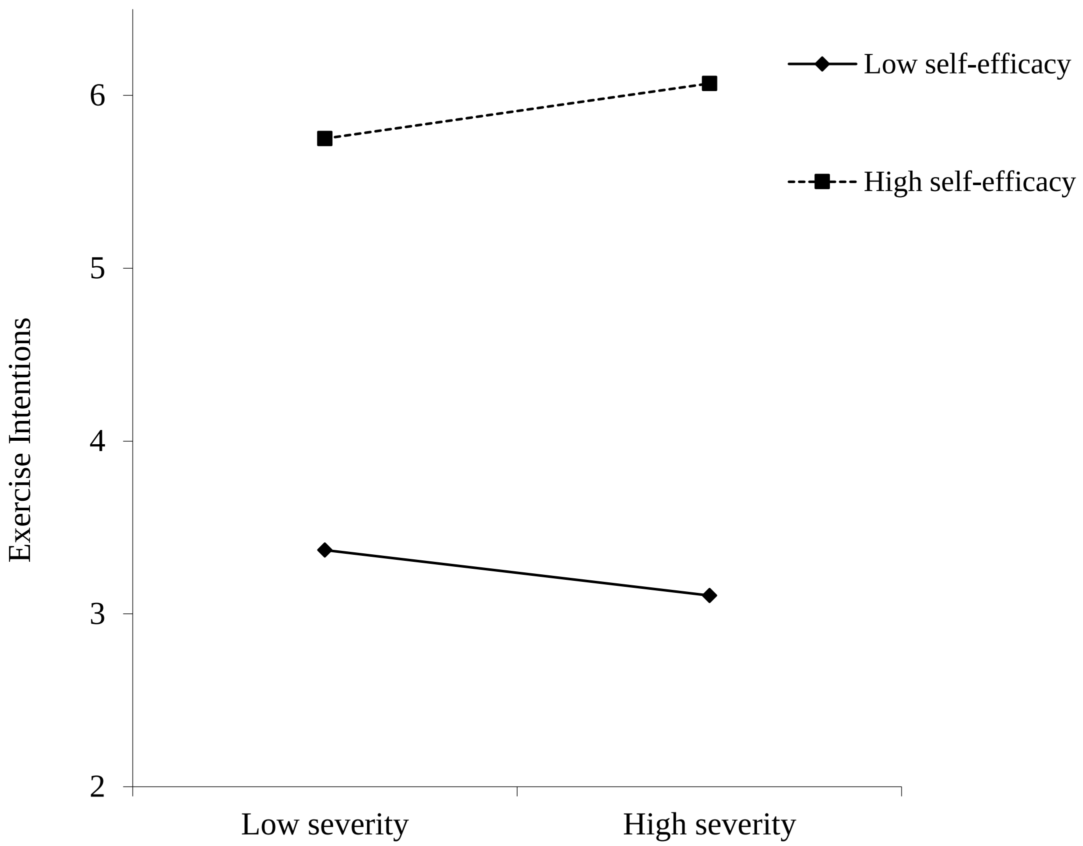

Figure 6.1. Intentions to exercise 30 minutes per day 5 days a week during the next month as a function of severity for both high and low self-efficacy.

The zero-order bivariate correlation of susceptibility with intentions (r = .02, p = .63), coupled with its significant negative relationship with self-efficacy (r = -.20, p < .001) suggested that susceptibility acted as a suppressor variable within the regression equation. Confidence intervals for the bootstrapped point estimate of the indirect effect confirmed the suppressing effect susceptibility exerted on self-efficacy (M = -.03, SE = .01, 95% C.I. = -.06. – -.01). This indicates that intentions were uncorrelated with the shared variance between self-efficacy and susceptibility.

Avoid foods high in fat. Hierarchical regression analyses revealed that self-efficacy and response-efficacy were significant predictors of intentions to avoid foods high in fat ($F(4,493) = 60.36$, $p < .001$, $AICc$ =168.67). Although the effect of susceptibility on intentions was also significant, investigation of the correlation matrices revealed a significant was likely acting as a suppressor variable within the regression equation as it was uncorrelated with intentions and negatively associated with self-efficacy. Bootstrapped confidence intervals were calculated to determine whether the presence of susceptibility in the model significantly increased the predictive validity of self-efficacy. The point estimate was negative and significant at the 95% confidence level (M = -.02, SE = .01, 95% C.I. = -.05 – -.01) indicating that susceptibility exerted a significant suppressing effect on self-efficacy. The threat* efficacy interaction terms ($\Delta F(4,489) = .72$, $p = .58$, $AICc$ = 173.95) and health knowledge variables ($\Delta F(2,487)$ = 1.20, $p = .15$, $AICc$ = 174.19) did not contribute unique variance to the model. However, past intake of fast foods was a significant predictor ($F(1,486) = 5.92$, $p < .05$, $AICc$ = 170.26). The final model explained 33.10% of the variance in intentions ($F(11,486) = 23.36$, $p < .001$, $f^2 = .49$).

Fast Food. Hierarchical regression analysis revealed a significant model which explained 35.47% of the variance in intentions to avoid fast food high in fat ($F(11,486)$ = 25.84, $p < .001$, $f^2 = .55$). The PMT-R variables were found to explain 34.02% of the variance in intentions ($F(4,493) = 65.07$, $p < .001$, AIC = 141.83). Self- and response-efficacy were both significant predictors. Investigation of the correlation matrices revealed a significant negative relationship between susceptibility and self-efficacy (r = -.21, $p < .001$). The bootstrapped point estimate for the suppression effect suggested that susceptibility acted as a suppressor, significantly increasing the regression coefficient of self-efficacy (M = -.03, SE = .01, 95% C.I. = -.06. – -.01). The threat * efficacy interaction variables did not add significant variance to the model ($\Delta F(4,489) = 1.01$, $p = .40$, $AIC = 145.93$). Threat and efficacy health knowledge together explained a further 0.75% of the variance in intentions ($\Delta F(2,487) = 3.82$, $p < .05$, $AIC = 142.33$). However, only threat health knowledge emerged as a significant predictor. Past intake of fast food in turn explained a further 0.69% ($\Delta F(1,486) = 6.19$, $p < .05$, $AIC = 138.12$).

Avoid Soft Drink. Hierarchical regression analysis revealed that the PMT-R variables explained 27.93% of the variance in intentions to avoid soft drinks high in sugar ($F(4,493) = 49.15$, $p < .001$, $AIC = 302.70$). Self- and response-efficacy emerged as significant predictors. The threat * efficacy interaction variables ($\Delta F(4,489) = .25$, $p = .91$, $AIC = 309.91$) and health knowledge variables ($\Delta F(2,487) = 1.78$, $p = .17$, $AIC = 310.44$) did not contribute unique variance to the model. Past consumption of soft drinks explained a further 2.35% of the variance in intentions ($\Delta F(1,486) = 17.35$, $p < .001$, $AIC = 295.07$). The final model explained 30.06% of the variance in intentions ($F(11,486) = 20.42$, $p < .001$), a large effect size ($f^2 = .43$).

Avoid foods high in sugar. Hierarchical regression analyses revealed a significant model of intentions to avoid foods high in sugar ($F(11,486) = 23.78$, $p < .001$, $R^2_{Adj} = .34$, $f^2 = .50$). The PMT-R variables were found to explain 31.50% of the variance in intentions ($F(4,493) = 58.13$, $p < .001$, $AICc = 130.32$). Self- and response-efficacy were significant predictors of intentions. The effect of susceptibility was also significant. The threat * efficacy interaction variables were not significant predictors ($\Delta F(4,489) = .91$, $p = .46$, $AICc = 134.84$) suggesting that efficacy perceptions did not moderate the effect of threat on intentions. Threat and efficacy health knowledge explained a further 0.92% ($\Delta F(2,487) = 4.34$, $p < .05$, $AICc = 130.21$) and past intake of foods high in sugar in turn explained a further 1.17% of the variance in intentions (ΔF(1,486) = 9.57, p < .005, *AICc* = 122.59).

A zero-order correlation was recorded between susceptibility and intentions (r = .07, p = .14) and a significant negative relationship emerged between susceptibility and self-efficacy (r = -.16, p < .001). Further, the point estimate for the suppressing effect of susceptibility derived using bootstrapping was significant (M = -.03, SE = .01, 95% C.I. = -.06. – -.01; cf. Preacher et al., 2008). This suggests that susceptibility acted as a suppressor variable within the regression equation, increasing the predictive validity of self-efficacy within the model.

Applying the TPB to the prediction of intentions to exercise 30 minutes per day five days per week, maintain a healthy diet, avoid foods high in fat, avoid fast food, avoid soft drinks and avoid foods high in sugar.

Similar to the PMT-R analyses, hierarchical regression analyses were utilised to test the predictions of the TPB. The structure of the analyses was similar for each of the health behaviours investigated. Block 1 contained the TRA variables (i.e., attitudes and injunctive norms), block 2 contained the remaining TPB variables (self-efficacy and perceived controllability) and block 3 contained descriptive norms. Block 4 contained motivation to comply and the Injunctive norms * motivation to comply (IN*MTC) interaction term. Block 5 contained threat and efficacy health knowledge and block 5 contained prior health behaviour. Power to find a small effect size (f^2 = .02) exceeded .90, and power to find a small-medium effect size (f^2 = .15) exceeded .99 for all analyses.

Exercise 30 mins. Hierarchical regression analyses revealed a significant model of intentions to exercise for 30 minutes per day 5 days per week during the next month (F(10,486) = 49.42, p < .001, R^2_{Adj} = .59, f^2 = .97; see table 6.8). The TRA variables explained 14.18% of the variance in intentions (*F*(2,495) = 42.06, $p < .001$, *AICc* = 558.72). The addition of self-efficacy and perceived controllability explained a further 34.03% of the variance in intentions ($\Delta F(2,493) = 163.62$, $p < .001$, *AICc* = 309.25). However, contrary to predictions perceived controllability registered a negative beta coefficient. Descriptive norms ($\Delta F(1,492) = 1.74$, $p = .19$, *AICc* = 309.53), IN*MTC ($\Delta F(2,490) = 1.02$, $p = .36$, *AICc* = 311.58) and the health knowledge variables ($\Delta F(2,488) = .08$, $p = .92$, *AICc* = 315.55) all did not contribute unique variance to the model. Past exercise behaviour explained a further 0.99% of the variance ($\Delta F(1,487)$ = 13.08, $p < .001$, *AICc* = 300.93).

Perceived controllability registered a moderate positive correlation with intentions (see table 6.1). However, within the context of the regression model its β-value was significant but negative. A strong association between perceived controllability and self-efficacy was also noted. This pattern of results may indicate negative suppression (Pandey et al., 2010; Tzelgov et al., 1991). In negative suppression relationships the suppressor variable is positively associated with the dependant variable, but is also (more strongly) associated with the error variance in a stronger predictor of the dependant variable. As such, there is a trade-off between the positive bivariate effect on the dependant variable and offsetting the error variance in the other predictor – this results in the net effect of the suppressor being negative. The Preacher et al., (2008) bootstrapping method was utilised to investigate whether the negative effect of perceived controllability on intentions represented negative suppression. The bootstrapped 95% confidence interval for the point estimate did not contain zero (*M* = .44, *SE* = .04, bootstrapped 95% C.I. = .37 – .53) indicating that perceived controllability acted as a suppressor variable within the regression equation. This

Table 6.8

Results of Hierarchical Regression Analysis Investigating the Predictions of the TPB for each of the Six Health Behaviours Investigated.

		Exercise 30 Mins		Healthy Diet		Avoid Fat		Avoid Fast Food		Avoid Soft Drink		Avoid Sugar	
	Predictor	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}
Step 1:	Attitudes	.25****	.14****	.31****	.14****	.39****	.21****	.41****	.17****	.42****	.19****	.40****	.18****
	Injunctive Norms	.21****		.17****		.17****		.06		.07		.09*	
Step 2:	Attitudes	.11***	.48****	.20****	.34****	.26****	.38****	.26****	.38****	.26****	.34****	.29****	.37****
	Injunctive Norms	.07*		.11***		.13****		.09*		.11***		.10**	
	PBC	-.09*		.05		.00		.03		.01*		.06	
	Self-efficacy	.67****		.43****		.44****		.46****		.37****		.43****	
Step 3:	Attitudes	.11***	.48	.20****	.36****	.27****	.38	.26****	.38*	.26****	.34	.29****	.37
	Injunctive Norms	.06		.07		.13****		.07		.09*		.09*	
	PBC	-.08*		.06		.00		.02		.11*		.05	
	Self-efficacy	.66****		.39****		.44****		.44****		.35****		.42****	
	Descriptive Norms	.05		.16****		.03		.09**		.07		.05	
Step 4:	Attitudes	.11***	.48	.20****	.36	.26****	.38	.26****	.38	.26****	.34	.29****	.38
	Injunctive Norms	.06		.07		.12***		.06		.07		.08*	
	PBC	-.08*		.06		.01		.02		.11*		.06	
	Self-efficacy	.66		.40****		.44****		.45****		.36****		.42****	
	Descriptive Norms	.04		.15****		.01		.09*		.06		.05	
	MTC	.03		.04		.07		.04		.07		.05	
	IN*MTC	.03		.06		.04		.00		-.03		.04	

Table 6.8 continued

	Predictor	Exercise 30 Mins β	Exercise 30 Mins R^2_{Adj}	Healthy Diet β	Healthy Diet R^2_{Adj}	Avoid Fat β	Avoid Fat R^2_{Adj}	Avoid Fast Food β	Avoid Fast Food R^2_{Adj}	Avoid Soft Drink β	Avoid Soft Drink R^2_{Adj}	Avoid Sugar β	Avoid Sugar R^2_{Adj}
Step 5:	Attitudes	.11***	.48	.20****	.36	.26****	.39*	.25****	.39**	.25****	.35	.28****	.38*
	Injunctive Norms	.06		.07		.11		.06		.07		.08*	
	PBC	-.08*		.05		.00		.02		.10*		.05	
	Self-efficacy	.66		.39****		.43****		.43****		.35****		.42****	
	Descriptive Norms	.04		.15****		.02		.09*		.06		.05	
	MTC	.04		.05		.08*		.04		.07		.06	
	IN*MTC	.03		.07		.04		.01		-.03		.05	
	Threat HK	.00		.00		.01		.05		.04		.02	
	Efficacy HK	.01		.05		.08		.08		.04		.09*	
Step 6:	Attitudes	.11***	.49****	.19****	.36	.25****	.39	.25****	.39*	.25****	.37****	.27****	.39*
	Injunctive Norms	.07		.07		.12***		.08*		.09*		.08*	
	PBC	-.08*		.05		.00		.02		.11*		.06	
	Self-efficacy	.61****		.38****		.42****		.38****		.26****		.39****	
	Descriptive Norms	.02		.15****		.02		.08*		.06		.05	
	MTC	.04		.05		.08*		.04		.06		.07	
	IN*MTC	.03		.07		.04		.01		-.04		.05	
	Threat HK	-.01		.00		.01		.04		.02		.02	
	Efficacy HK	.02		.05		.08*		.08		.04		.09*	
	Past behaviour$_1$												
	Exercise	.13****											
	Fatty Foods			-.05		-.04							
	Fast Food			.02				-.11*					
	Soft Drink			-.01						-.18****			
	Sugary Food			-.03								-.09*	

Note. PBC = Perceived behavioural control, MTC = Motivation to comply, MTC*IN = motivation to comply * injunctive norms, HK = health knowledge, $_1$ = multiple measures of past behaviour, * = p < .05, ** = p <.01, *** = p <.005, **** = p < .001.

indicates that intentions were uncorrelated with the shared variance between perceived controllability and self-efficacy.

Healthy Diet. The TRA variables were found to explain 14.35% of the variance in intentions to maintain a healthy diet during the next month (F(2,495) = 42.65, $p <$ .001, $AICc$ = 303.94). Self-efficacy and perceived controllability explained a further 19.44% (ΔF(2,493) = 73.66, $p <$ .001, $AICc$ = 177.80) and descriptive norms in turn explained a further 1.95% (ΔF(1,492) = 15.94, $p <$ .001, $AICc$ = 163.97). The IN*MTC interaction term (ΔF(2,490) = 2.55, p = .08, $AICc$ = 162.92), health knowledge variables (ΔF(2,488) = .75, p = .48, $AICc$ = 165.54) and past behaviour variables (ΔF(4,484) = .91, p= .46, $AICc$ = 169.91) each did not contribute unique variance to the model. The final model explained 36.02% of the variance in intentions (F(13,483) = 22.53, $p <$ .001) a large effect size (f^2 = .56).

Avoid foods high in fat. Hierarchical regression analyses revealed that attitudes and injunctive norms were significant predictors of intentions to avoid foods high in fat (F(2,495) = 65.56, $p <$ .001, R^2_{Adj} = .21, $AICc$ = 246.09). Self-efficacy and perceived controllability explained a further 17.22% (ΔF(4,493) = 69.55, $p <$ .001, $AICc$ = 126.38). However, only self-efficacy was a significant predictor. Both descriptive norm (F(1,492) = .47, p = .49, $AICc$ = 127.94) and IN*MTC (ΔF(2,490) = 2.85, p = .06, $AICc$ = 126.09) did not contribute a significant proportion of unique variance to the model. Threat and efficacy health knowledge explained a further 0.53% of the variance in intentions (ΔF(2,488) = 3.09, $p <$ .05, $AICc$ = 124.17). However, only threat health knowledge was a significant predictor of intentions. Past intake of foods high in fat was not a significant predictor (ΔF(4,487) = 92, p = .34, $AICc$ = 125.31). The final model explained 38.75% of the variance in intentions (F(10,487) = 23.36, $p <$ .001), a large effect size (f^2 = .63).

Fast Food. Hierarchical regression analysis revealed a significant model which explained 39.11% of the variance in intentions to avoid fast food high in fat (F(10,487) = 33.83, p < .001, f^2 = .51). The TRA variables were found to explain 17.43% of the variance in intentions (F(2,495) = 53.47, p < .001, *AIC* = 251.53). However, only attitudes were a significant predictor. Perceived controllability and self-efficacy explained a further 20.19% (ΔF(2,493) = 81.10, p < .001, *AICc* = 113.89) and descriptive norms in turn explained a further 0.68% of the variance in intentions (ΔF(1,492) = 6.40, p < .05, *AICc* = 109.50). The IN*MTC interaction variable did not add significant variance to the model (ΔF(4,490) = .52, p = .60, *AIC* = 112.55). Threat and efficacy health knowledge together explained a further 0.93% of the variance in intentions (ΔF(2,488) = 4.77, p < .01, *AIC* = 107.05). However, neither variable emerged as a significant predictor. Past intake of fast food in turn explained a further 0.67% (ΔF(1,487) = 6.39, p < .05, *AIC* = 102.64).

Soft Drink. Hierarchical regression analysis revealed that the TRA variables explained 18.52% of the variance in intentions to avoid soft drinks high in sugar (F(2,495) = 57.48, p < .001, *AIC* = 361.77). Only attitudes emerged as a significant predictor. Self-efficacy and perceived controllability explained a further 15.44% (ΔF(2,493) = 58.65, p < .001, *AICc* = 259.18). Descriptive norms (ΔF(1,492) = 3.18, p = .08, *AIC* = 309.91), IN*MTC (ΔF(2,490) = 1.72, p = .18, *AICc* = 258.64) and health knowledge variables (ΔF(2,488) = 1.44, p = .24, *AICc* = 259.84) did not contribute unique variance to the model. Past consumption of soft drinks explained a further 2.40% of the variance in intentions (ΔF(1,487) = 19.60, p < .001, *AIC* = 242.27). The final model explained 36.96% of the variance in intentions (F(10,487) = 30.14, p < .001), a large effect size (f^2 = .59).

Avoid foods high in sugar. Hierarchical regression analyses revealed a significant model of intentions to avoid foods high in sugar ($F(10,487) = 32.93$, $p < .001$, $R^2_{Adj} = .39$, $f^2 = .64$). The TRA variables were found to explain 17.63% of the variance in intentions ($F(2,495) = 54.18$, $p < .001$, $AICc = 220.08$). Self-efficacy and perceived controllability explained a further 19.62% ($\Delta F(2,493) = 78.42$, $p < .001$, $AICc = 86.59$). Descriptive norms ($\Delta F(1,492) = 2.12$, $p = .15$, $AICc = 86.49$) and IN*MTC ($\Delta F(2,490) = 1.95$, $p = .14$, $AICc = 86.66$) each did not contribute to the regression model. Threat and efficacy health knowledge explained a further 0.81% ($\Delta F(2,488) = 4.24$, $p < .05$, $AICc = 82.23$) and past intake of foods high in sugar in turn explained a further 0.66% of the variance in intentions ($\Delta F(1,487) = 6.32$, $p < .05$, $AICc = 77.89$).

Comparison between PMT-R and TPB Models of Intention to Exercise 30 Minutes per day Five Days per Week, Maintain a Healthy Diet, Avoid Foods High in Fat, Avoid Fast Food, Avoid Soft Drinks and Avoid Foods High in Sugar

Akaike information criterion values and Akaike weights were utilised to compare ten separate models of intentions for each of the health behaviours investigated. The ten models were: 1) PMT-R (i.e., susceptibility, severity, response- and self-efficacy); 2) PMT-R plus threat * efficacy interaction variables; 3) Model 2 plus health knowledge; 4) Model 3 plus past behaviour 5) TRA (attitudes and injunctive norms); 6) TPB (i.e., TRA plus self-efficacy and perceived controllability); 7) Model 6 plus descriptive norms; 8) Model 7 plus injunctive norms * motivation to comply interaction variable; 9) Model 8 plus health knowledge; 10) Model 9 plus past behaviour.

Exercise 30 mins.

The model with the lowest AICc value for intentions to exercise 30 minutes per day 5 days per week was model 4 (PMT-R + threat * efficacy interactions + health knowledge + past exercise behaviour; see table 6.9). Model 4 was clearly superior to models 5, 8 and 9 ($\Delta_i > 10$) and had considerably greater support than models 1, 3, 6 and 7 ($\Delta_i > 8$). Models 2 ($w_i = .07$) and 10 ($w_i = .13$) were also relatively strong models in the candidate set but considerably were less likely than model 4 ($w_i = .75$) to be the best model of the set. This indicates that the addition of threat * efficacy interaction variables, health knowledge and past behaviour variables may be used to augment both the PMT-R and TPB for predicting intentions to exercise. The ratio of the Akaike weights for model 6 (TPB) and model 2 (PMT-R) was .16, indicating that PMT-R was 6.18 times more likely to be the better approximating model.

Healthy diet.

Model 8 (TPB + descriptive norms + IN*MTC) was the model with the greatest support for explaining intentions to maintain a healthy diet during the next month. Model 8 was found to be clearly superior to models 1 – 6 ($\Delta_i > 14$) and model 10 had considerably less support than model 8 ($\Delta_i > 6$). The Akaike weight for model 8 was calculated to be .53. By comparison the Akaike weight for model 7 was .31 ($\Delta_i = 1.04$) and .14 for model 9 ($\Delta_i = 2.62$). This indicates that model 8 was roughly equivalent to models 7 and 9. The TPB was found to have considerably greater support than the PMT-R. The probability that the TPB was the superior model of the two was greater than 99.90%. This suggests that the TPB should be preferred over PMT-R for predicting intentions to maintain a healthy diet.

Avoid foods high in fat.

Model 9 (TPB + descriptive norms + IN*MTC + health knowledge) was found to be the model with the lowest AICc value for intentions to avoid foods high in fat during the next month. Model 9 was clearly superior to models 1 – 5 ($\Delta_i > 40$). The Akaike weight for model 9 was .42 indicating that other models were also plausible. Model 9 was roughly equivalent to models 6 ($w_i = 14$), 8 ($w_i = 14$) and 10 ($w_i = 24$), but had greater

Table 6.9

Results of AICc Analysis for Competing Models of Intentions to Engage in all Health Behaviours Investigated

Health Behaviour	Model No.	k_i	$AICc_i$	Δ_i	w_i	TPB:PMT
Exercise 30 mins	1	4	309.32	8.47	.01	.16
	2	6	305.61	4.68	.07	
	3	10	309.64	8.70	.01	
	4	11	300.93	.00	.75	
	5	2	558.72	257.79	.001	
	6	4	309.25	8.32	.01	
	7	5	309.53	8.60	.01	
	8	7	311.58	10.65	<.001	
	9	9	315.55	14.62	<.001	
	10	10	304.43	3.50	.13	
Healthy diet	1	4	205.94	43.02	<.001	$1.19 * 10^8$
	2	6	210.39	47.47	<.001	
	3	10	212.94	50.02	<.001	
	4	14	215.01	52.09	<.001	
	5	2	303.94	141.02	<.001	
	6	4	117.80	14.88	<.001	
	7	5	163.97	1.04	.31	
	8	7	162.92	.00	.53	
	9	9	165.54	2.62	.14	
	10	13	169.91	6.99	.02	
Avoid foods high in fat	1	4	168.67	44.50	<.001	$2.14 * 10^{11}$
	2	6	173.95	49.78	<.001	
	3	10	174.19	50.02	<.001	
	4	11	170.26	46.09	<.001	
	5	2	246.09	121.92	<.001	
	6	4	126.38	2.21	.14	
	7	5	127.94	3.77	.06	
	8	7	126.29	2.12	.14	
	9	9	124.17	.00	.42	
	10	10	125.31	1.14	.24	
Fast food	1	4	141.83	39.18	<.001	$9.07 * 10^7$
	2	6	145.93	43.29	<.001	
	3	10	142.33	39.69	<.001	
	4	11	138.12	35.48	<.001	
	5	2	251.48	148.84	<.001	
	6	4	113.89	11.24	.003	
	7	5	109.50	6.85	.02	
	8	7	112.55	9.90	.01	
	9	9	107.05	4.41	.09	
	10	10	102.64	.00	.87	

Health Behaviour	Model No.	k_i	$AICc_i$	Δ_i	w_i	TPB:PMT
Soft drink	1	4	302.70	60.43	<.001	$1.04 * 10^{12}$
	2	6	309.91	67.64	<.001	
	3	10	310.44	68.17	<.001	
	4	11	295.07	52.80	<.001	
	5	2	361.77	119.50	<.001	
	6	4	259.18	16.91	<.001	
	7	5	258.01	15.74	<.001	
	8	7	258.64	16.37	<.001	
	9	9	259.84	17.57	<.001	
	10	10	242.27	.00	.999	
Avoid foods high in sugar	1	4	130.32	52.43	<.001	$3.00 * 10^{11}$
	2	6	134.84	56.95	<.001	
	3	10	130.21	52.32	<.001	
	4	11	122.59	44.70	<.001	
	5	2	220.08	142.19	<.001	
	6	4	86.59	8.70	.01	
	7	5	86.49	8.60	.01	
	8	7	86.66	8.77	.01	
	9	9	82.23	4.34	.09	
	10	10	77.89	.00	.87	

Note — k_i = number of parameters for model *i*; $AICc_i$ = Akaike information criterion (corrected) value for model *i*; $\Delta_i = AICc_i$ - minimum AICc value for the candidate set ($\Delta_i = 0$ for model with minimum AICc value); w_i = rounded Akaike weights; TPB:PMT = ratio of Akaike weights for model 6 (Theory of Planned Behaviour) to model 2 (revised version of Protection Motivation Theory with interaction variables), value represents how many times more likely it is that the Theory of Planned Behaviour is the best approximating model of the two models (values < 1 indicate that PMT-R is the superior model, values > 1 indicate that the TPB is the superior model); Model 1 = PMT-R (i.e., susceptibility, severity, response- and self-efficacy); Model 2 = PMT-R plus threat * efficacy interactions; Model 3 = Model 2 plus health knowledge; Model 4 = Model 3 plus past behaviour; Model 5 = TRA (attitudes and injunctive norms); Model 6 = TPB (i.e., TRA plus self-efficacy and perceived controllability); Model 7 = Model 6 plus descriptive norms; Model 8 = Model 7 plus IN*MTC interaction variable; Model 9 = Model 8 plus health knowledge; Model 10 == Model 9 plus past behaviour.

support than model 7 (w_i = .06). The probability that the TPB was a better approximating model than PMT-R was greater than 99.99%. Taken together these findings suggest that the TPB is a better approximating model of intentions to avoid fatty foods than PMT-R, and the predictive validity of the TPB may be improved by adding descriptive norms and health knowledge to the model.

Avoid fast food.

Model 10 (TPB + descriptive norms + IN*MTC + health knowledge + past behaviour) was found to have the lowest AICc value for participants' intentions to avoid fast food during the next month. Model 10 was found to be clearly superior to models 1 – 6 (Δ_i > 11) and had considerably greater support than models 7 – 9 (Δ_i > 4). The estimated likelihood that model 7 was the superior model of the candidate set was 86.69%. This indicates that the addition of descriptive norms, health knowledge and past behaviour to the TPB increases the predictive power of the TPB. The TPB was over nine million times more likely to be the best approximating model of intentions when compared with PMT-R.

Avoid soft drink.

Model 10 was the model with the greatest support for explaining intentions to avoid soft drinks high in sugar during the next month. Model 10 was found to be clearly superior to models 1 – 9 (Δ_i > 15). The Akaike weight for model 10 was calculated to be greater than .99. This indicates that model 10 was clearly a superior approximating model than the remaining 9 models. The TPB was found to have considerably greater support than the PMT-R. The probability that the TPB was the superior model of the two was greater than 99.99%. This suggests that the TPB should be preferred over PMT-R for predicting intentions to avoid soft drink.

Avoid foods high in sugar.

Model 10 was again found to be the model with the lowest AICc value for intentions to avoid foods high in sugar during the next month. Model 10 was clearly superior to models 1 – 5 (Δ_i > 40). The Akaike weight for model 10 was .87 indicating that it was clearly the model with the greatest support. Model 9 was the second most likely model with an Akaike weight of .10. The probability that the TPB was a better approximating model than PMT-R was greater than 99.99%. Taken together these findings suggest that the TPB is a better approximating model than PMT-R. Further, the predictive validity of the TPB for explaining intentions to avoid foods high in sugar may be improved by adding descriptive norms, health knowledge and past behaviour to the model.

Predictions of the Integrated Model

Path analyses were utilised to test the integrated model's predictions. These data were analysed using AMOS 20. The comparative fit index (CFI; Bentler, 1990) and root mean squared error of approximation (RMSEA; Nevitt & Hancock, 2000) were utilised as measures of model fit. Models were considered to be adequate when CFI > .90 (preferably > .95) and RMSEA < .08 (preferably < .06; Hu & Bentler, 1999). Due to theoretical links between variables in the model certain exogenous variables were allowed to covary. In each of the models covariances were drawn between threat and efficacy health knowledge, perceived control and past behaviour, and injunctive and descriptive norms. The error variances between the two threat variables (susceptibility and severity) and the two efficacy variables were also freed to covary (response-efficacy and self-efficacy). Klein (1998) recommends that at least ten cases for every parameter to be estimated (preferably 20) within a path analysis, when less than five cases per parameter are collected the parameter estimates may be untenable. The number of parameters estimated was 36 (13.89 cases per parameter estimate) for all health behaviours except healthy diet where the number of parameters estimated was 49 due to the extra measures of past behaviour (10.20 per parameter). This indicates that the sample size is likely to be adequate to perform the path analyses.

Exercise 30 mins.

Path analysis provided partial support for the integrated model. Intentions to exercise for 30 minutes per day 5 days per week were found to be predicted by attitudes and self-efficacy (see figure 6.2). Contrary to predictions injunctive and descriptive norms exerted no effect on intentions. Perceived controllability, past behaviour and efficacy health knowledge predicted self-efficacy. However, contrary to predictions the efficacy health knowledge was negatively associated with self-efficacy. Also contrary to predictions response-efficacy was the only significant predictor of attitudes. Threat health knowledge was positively associated with severity and response-efficacy. Overall the integrated model was a poor fit to the data (see table 6.10).

Table 6.10

Goodness of Fit Indices for each of the Six Health Behaviours Investigated

Health Behaviour	χ^2	*df*	χ^2/df	CFI	RMSEA
Exercise 30 minutes	439.09*	42	10.45	.69	.14
Healthy diet	504.73*	69	7.31	.73	.11
Avoid fat	399.99*	42	9.52	.60	.13
Fast food	426.33*	42	10.15	.71	.14
Soft drink	346.03*	42	8.24	.73	.12
Avoid sugar	404.87*	42	9.64	.67	.13

Note. CFI = comparative fit index. RMSEA = root mean squared error of approximation. * = $p < .001$.

Healthy diet.

As predicted attitudes (β = .22), self-efficacy (β = .44) and injunctive (β = .08) and descriptive norms (β = .16) each predicted intentions to maintain a healthy diet during the next month (see figure 6.3). The only significant predictor of attitudes was response-efficacy. Perceived controllability (β = .49) and past intake of fast food (β = -.22) were found to predict self-efficacy. All other past bad dietary habits (i.e., past intake of foods high in fat, soft drink and foods high in sugar) did not contribute unique variance to the prediction of self-efficacy. Threat health knowledge was found to predict severity (β =

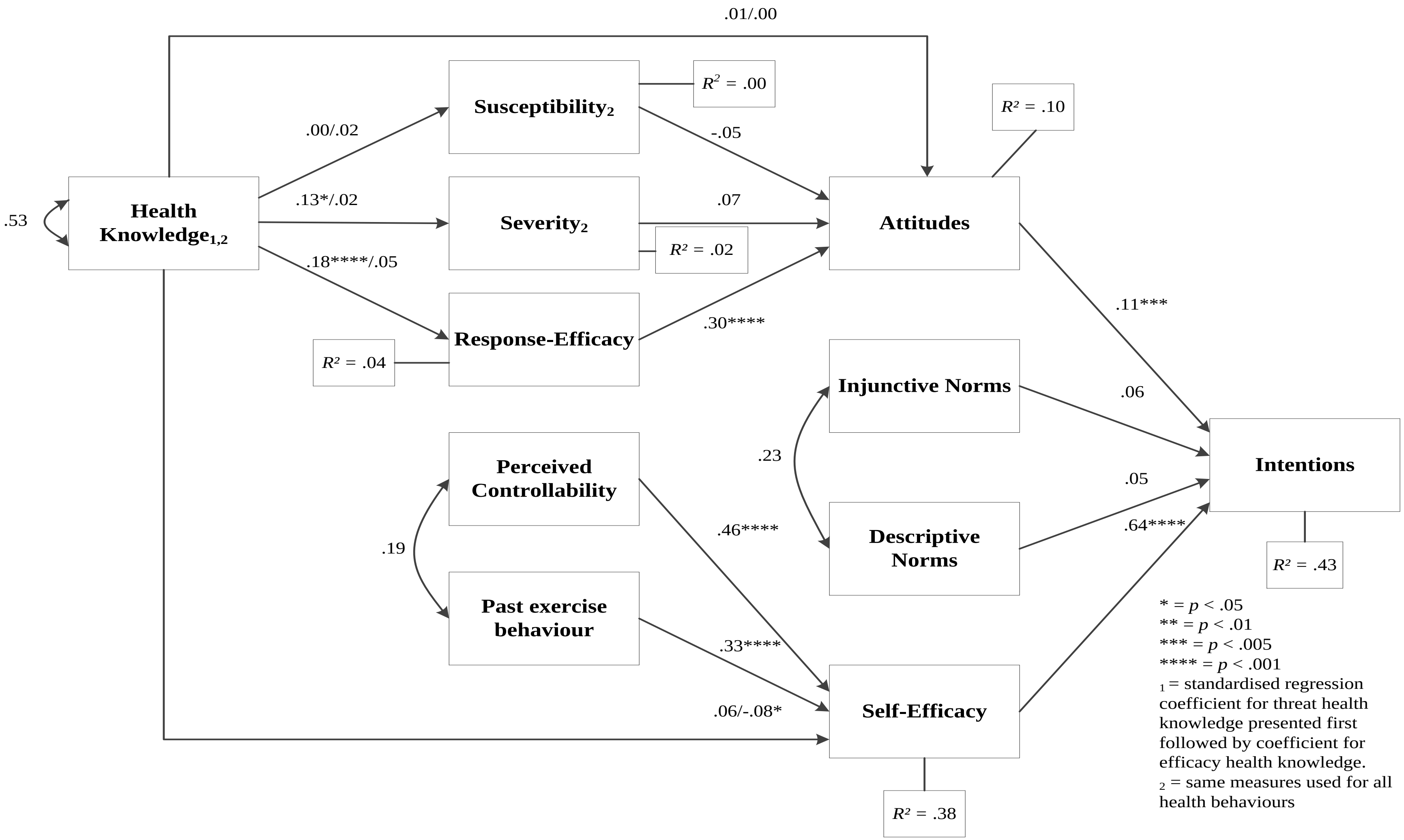

Figure 6.2. Application of a proposed integrated model to intentions to exercise 30 minutes per day 5 days per week during the next month: path model showing standardised beta coefficients for all proposed relationships (error terms removed for the sake of clarity).

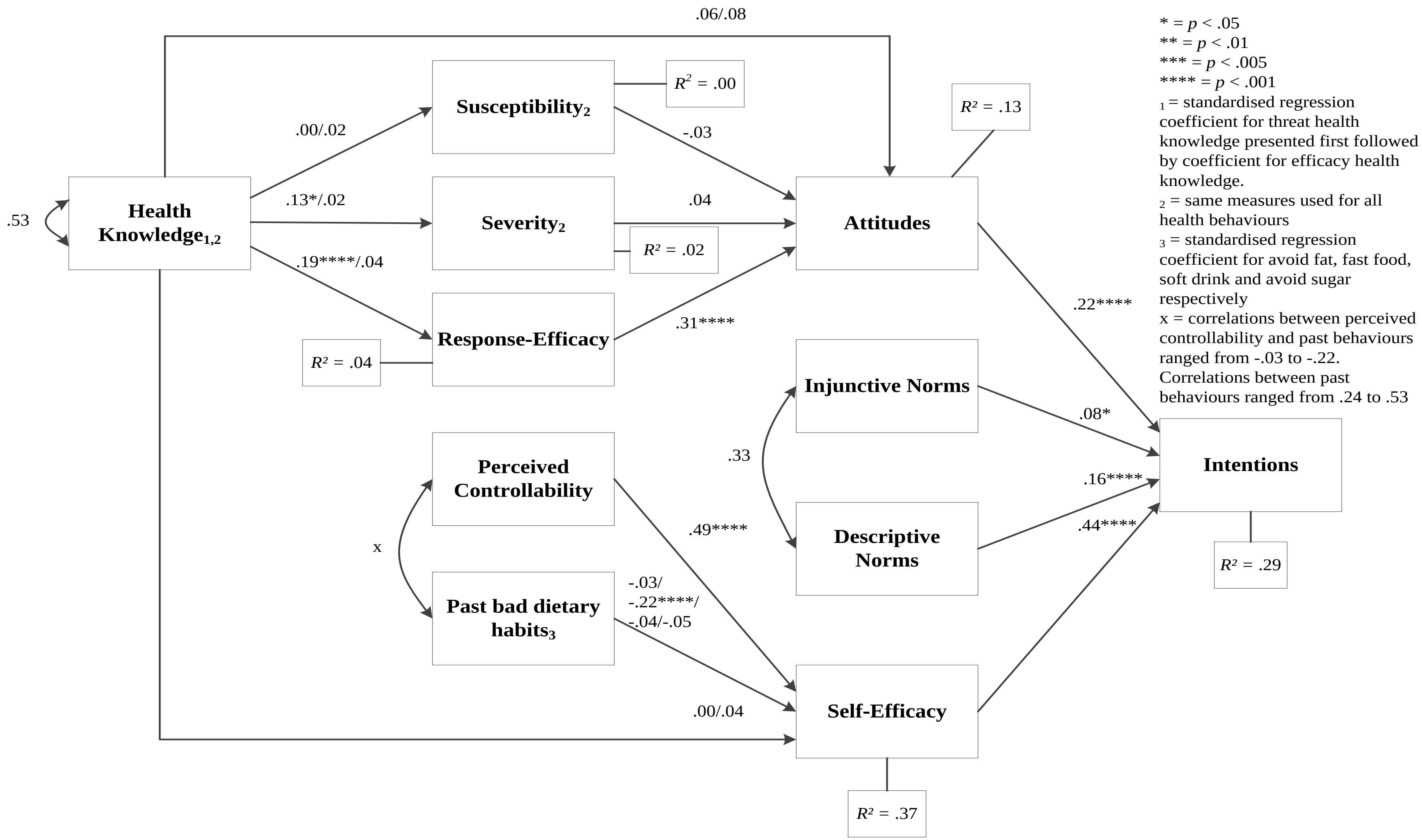

Figure 6.3. Application of a proposed integrated model to intentions to maintain a healthy diet during the next month: path model showing standardised beta coefficients for all proposed relationships (error terms removed for the sake of clarity).

.13) and response-efficacy (β = .19). However, goodness of fit indices revealed that the integrated model was a poor fit to the data (CFI < .90; RMSEA > .08).

Avoid foods high in fat.

Although the results partially supported the predictions of the integrated model, the overall path model was a poor fit to the data (see table 6.10). Attitude, injunctive norms and self-efficacy were each found to be predictors of intentions to avoid foods high in fat during the next month (see figure 6.4). Contrary to predictions descriptive norms did not contribute significant unique variance. Severity and response-efficacy were both predictors of attitudes, but susceptibility was not. Self-efficacy was predicted by both perceived controllability and past intake of fatty foods. Threat health knowledge was associated with both severity and response-efficacy. Contrary to predictions efficacy health knowledge exerted no unique effect on attitudes, response- or self-efficacy.

Avoid fast food.

Attitudes (β = .28), injunctive norms (β = .08), descriptive norms (β = .10) and self-efficacy (β = .47) each predicted intentions to avoid fast food high in fat during the next month explaining approximately 32% of its variance (see figure 6.5). The only significant predictor of attitudes was response-efficacy (β = .36) which explained approximately 16% of its variance. Perceived controllability (β = .43) and past intake of fast food (β = -.41) explained approximately 45% of the variance in self-efficacy perceptions. Threat health knowledge was a positive predictor of severity and response-efficacy only. Goodness of fit indices indicated that the model was a poor fit to the data (i.e., CFI < .90, RMSEA > .08).

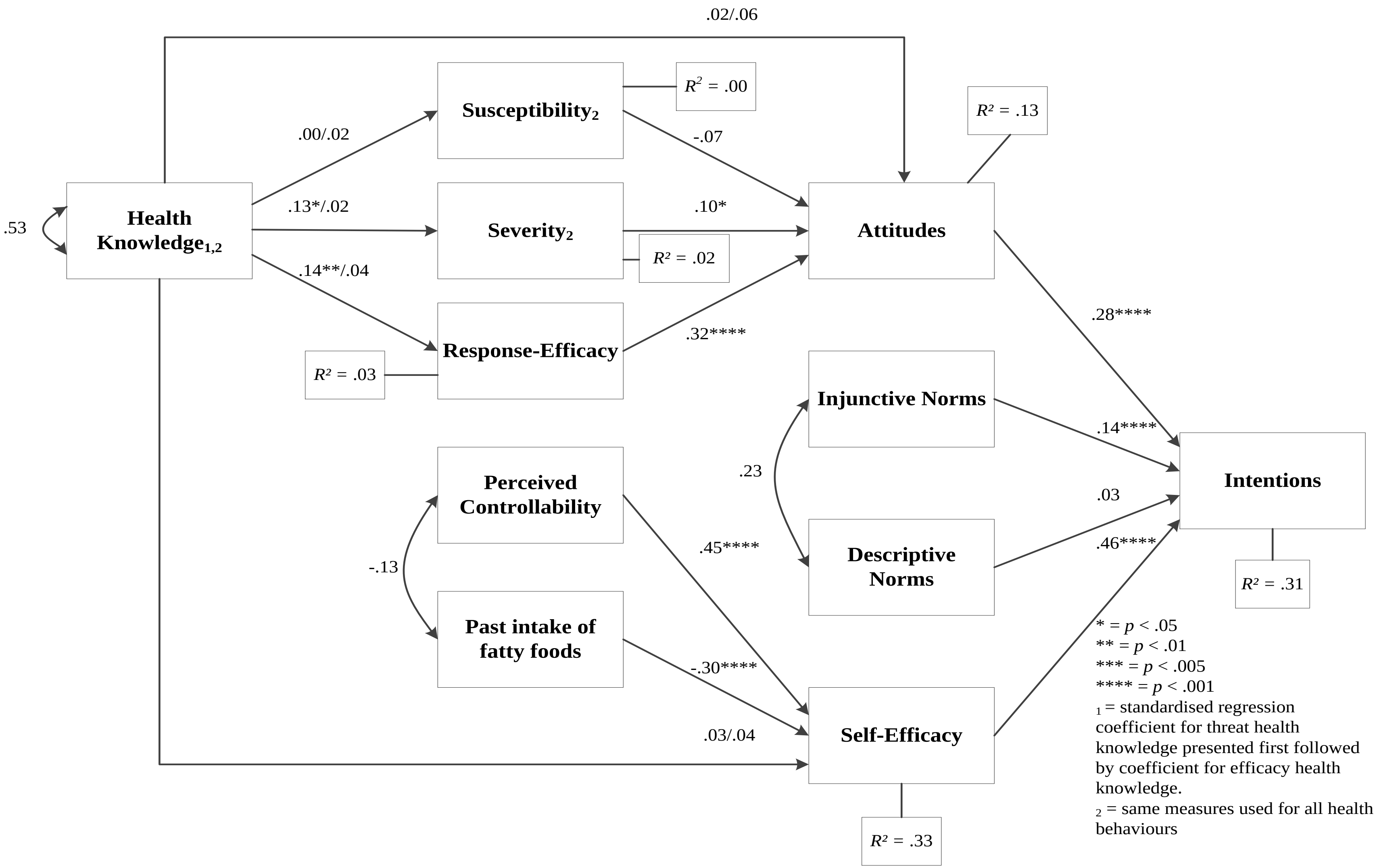

Figure 6.4. Application of a proposed integrated model to intentions to avoid foods high in fat during the next month: path model showing standardised beta coefficients for all proposed relationships (error terms removed for the sake of clarity).

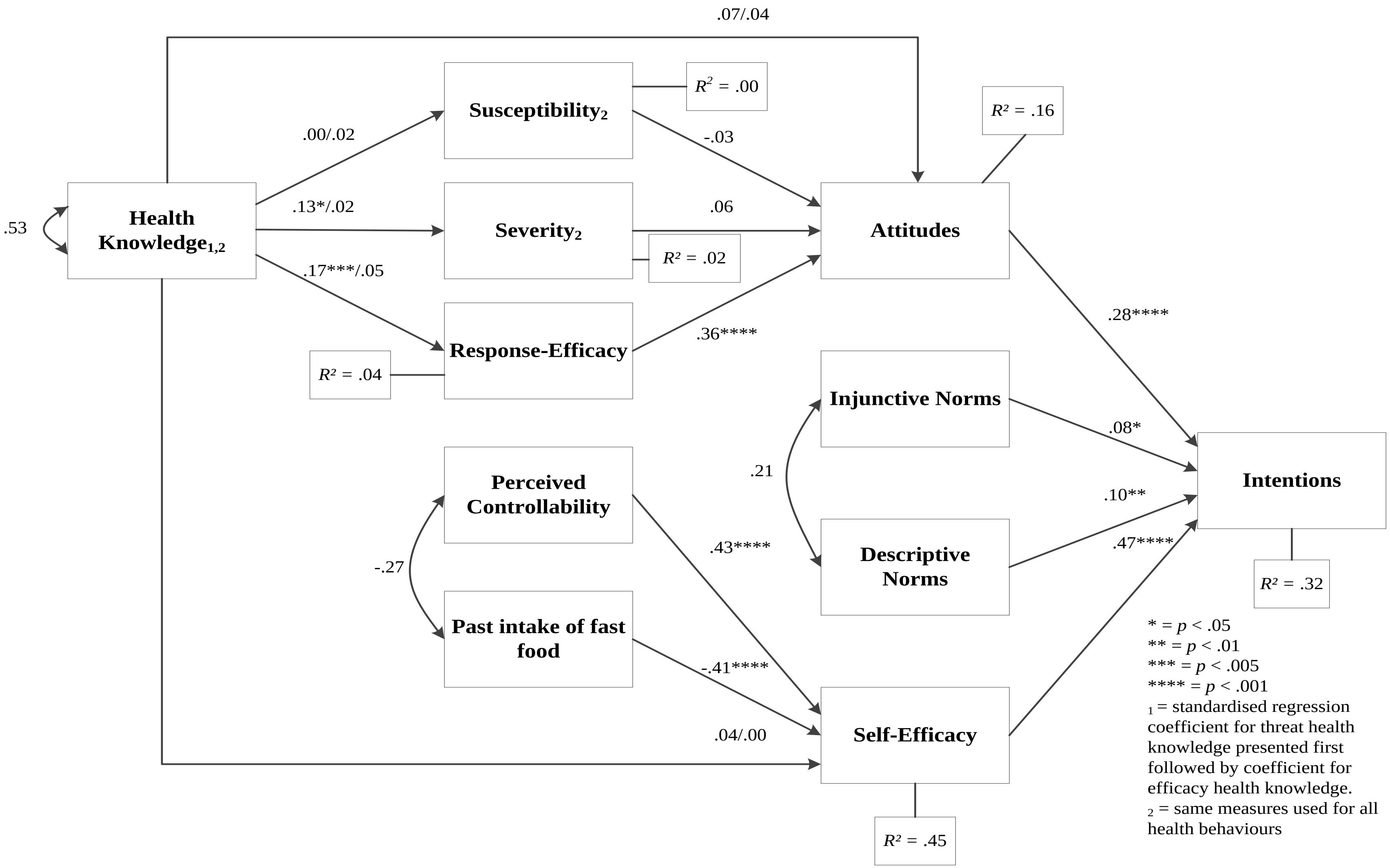

Figure 6.5. Application of a proposed integrated model to intentions to avoid fast food high in fat during the next month: path model showing standardised beta coefficients for all proposed relationships (error terms removed for the sake of clarity).

Avoid soft drink.

Intentions to avoid soft drink high in sugar during the next month were predicted by attitudes, injunctive norms and self-efficacy (R^2 = .28; see figure 6.6). The only significant predictor of attitudes was response-efficacy (R^2 = .13); susceptibility, severity and health knowledge exerted no unique effect. Perceived controllability, past intake of soft drink and threat health knowledge were each significant predictors of self-efficacy (R^2 = .38). Threat health knowledge was also positively associated with response-efficacy and severity. However, goodness of fit statistics indicated that the integrated model as a whole was a poor fit to the data.

Avoid foods high in sugar.

Intentions to avoid foods high in sugar were found to be predicted by attitudes, injunctive norms, and self-efficacy (see figure 6.7). Descriptive norms exerted no unique effect. The only significant predictor of attitudes was response-efficacy. Self-efficacy was positively associated with perceived controllability and negatively associated with past intake of sugary foods. Threat health knowledge was found to predict both severity and response-efficacy. Efficacy health knowledge was found to predict response-efficacy only. The overall model was a poor fit to the data (CFI < .90, RMSEA > .08).

Modifications made to the Integrated Model.

As the integrated model was found to be a poor fit to the data for each of the health behaviours investigated, modification indicies were explored (using AMOS) in order to ascertain whether the addition of causal paths to the model could improve model fit. Pathways were added if, and only if, 1) modification indicies indicated that the addition of the path would significantly and substantially reduce the chi-squared statistic associated with the model (i.e., χ^2_{diff} > 10) and 2) it could be reasonably inferred that

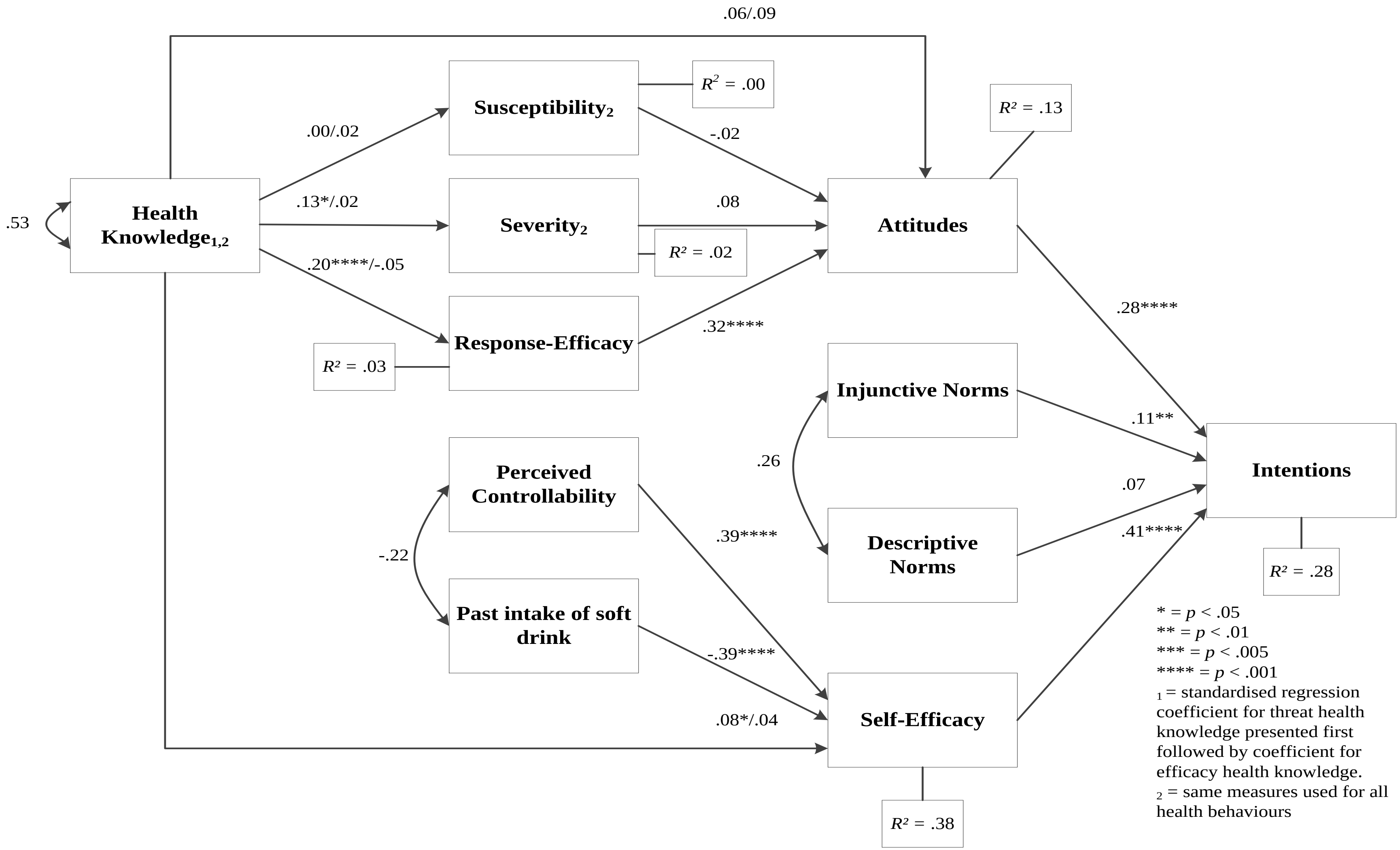

Figure 6.6. Application of a proposed integrated model to intentions to avoid soft drinks high in sugar during the next month: path model showing standardised beta coefficients for all proposed relationships (error terms removed for the sake of clarity).

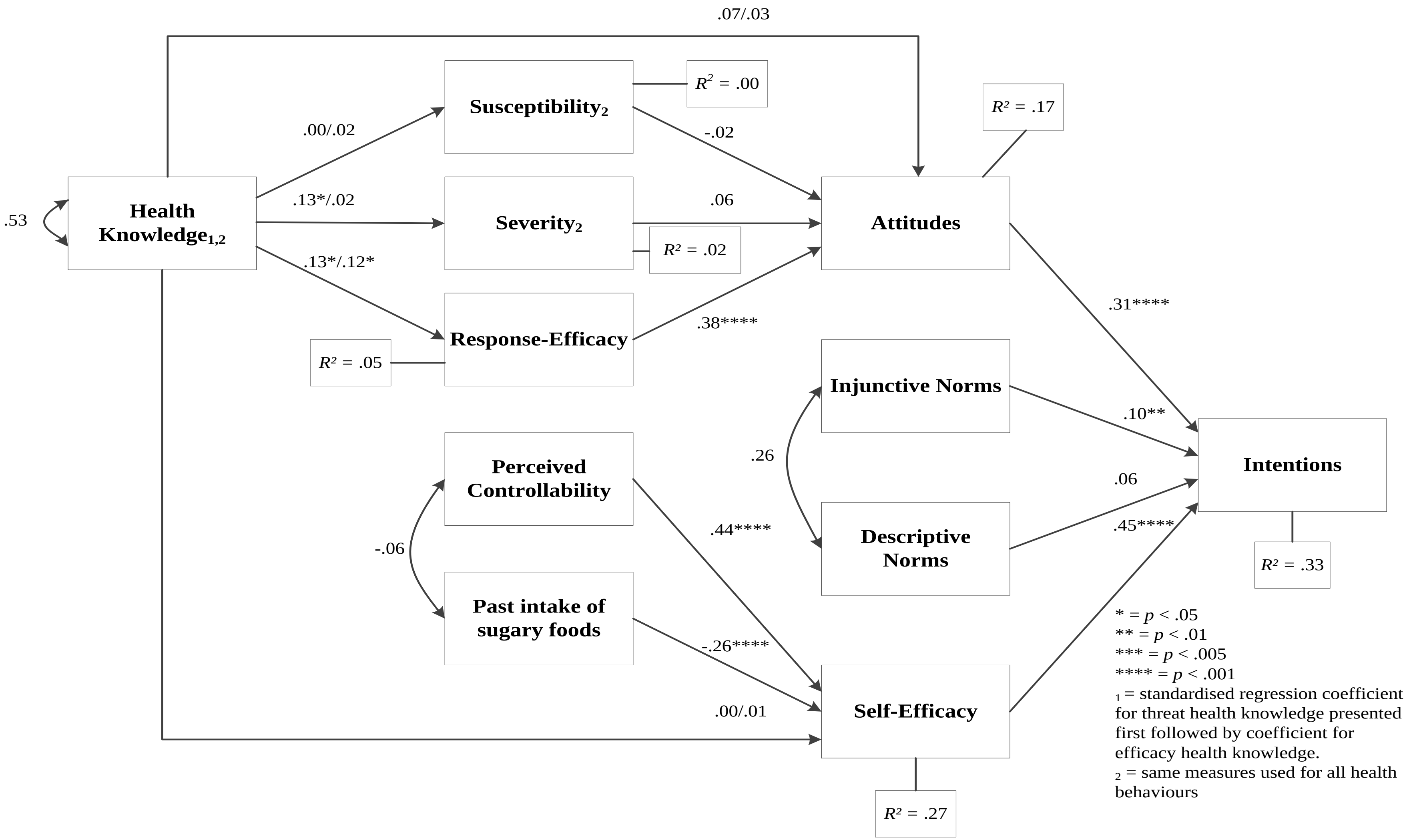

Figure 6.7. Application of a proposed integrated model to intentions to avoid foods high in sugar during the next month: path model showing standardised beta coefficients for all proposed relationships (error terms removed for the sake of clarity).

the pathway represents a causal relationship or association based of the relevant theory and operationalisations of the variables involved. Modifications to the model were performed individually, beginning by adding the pathway with the largest modification index. Following each modification the relationships between variables and goodness of fit statistics were re-calculated, and modification indices re-investigated until no further modifications were possible or feasible (see table 6.11). Akaike information criterion values were utilised to compare the models and revealed that each of the additions made substantially improved model fit (all Δ_is > 10).

For each of the health behaviours investigated, causal relationships between perceived controllability and response-efficacy and injunctive norms and response-efficacy were added – substantially improving model fit. Further, allowing perceived controllability and injunctive norms to co-vary improved model fit for all health behaviours (see figures 6.8 – 6.13 [only models with all modifications made are shown] and table 6.11). Allowing self-efficacy to be a predictor of attitudes improved model fit for exercising 30 mins per day five days per week, avoiding foods high in fat, avoiding fast food high in fat and avoiding soft drink. Additionally, adding causal pathways between injunctive norms and attitudes, and descriptive norms and self-efficacy improved model fit for exercising 30 minutes per day five days per week; and allowing descriptive norms and fast food intake to co-vary and adding a causal relationship between descriptive norms and self-efficacy improved model fit for maintaining a healthy diet. Following the addition of these pathways, the model for maintaining a healthy diet exceeded the less stringent cut off values for a well-fitting model (i.e., CFI > .90, RMSEA < .08) but failed to exceed the more stringent cut-offs (i.e., CFI > .95, RMSEA < .06; Hu & Bentler, 1999) – indicating that this model was an acceptable fit to the data (Bentler, 1990). Although adding pathways improved model fit for each of the other health behaviours investigated, these models remained a poor fit to the data.

Table 6.11

Goodness of Fit Indices and Akaike Information Criterion Values for each of the Modifications Made to the Integrated Model for each the Six Health Behaviours Investigated

Health Behaviour	χ^2	*df*	χ^2/df	CFI	RMSEA	$AICc_i$	Δ_i
Exercise 30 minutes							
Original Model	439.09*	42	10.45	.69	.14	519.03	240.35
PC → RE	363.20*	41	8.86	.75	.13	444.75	166.07
PC ←→ IN	318.95*	40	7.97	.78	.12	402.13	123.45
IN → Att.	275.82*	39	7.07	.82	.11	360.63	81.95
IN → RE	236.55*	38	6.23	.85	.10	323.01	44.33
DN → SE	212.17*	37	5.73	.86	.10	300.28	21.60
SE → Att.	188.90*	36	5.25	.88	.09	278.68	.00
Healthy diet							
Original Model	504.73*	69	7.31	.73	.11	629.30	288.55
PC → RE	337.38*	68	4.96	.83	.09	463.25	122.50
IN → RE	271.64*	67	4.05	.87	.08	398.83	58.08
PC ←→ IN	241.23*	66	3.66	.89	.07	369.75	28.99
DN ←→ Fast food	226.18*	65	3.48	.90	.07	356.04	15.29
DN → SE	209.54*	64	3.27	.91	.07	340.75	.00
Avoid fat							
Original Model	399.99*	42	9.52	.60	.13	479.93	182.19
PC → RE	308.36*	41	7.52	.76	.12	389.91	92.18
IN → RE	257.65*	40	6.44	.81	.11	340.83	43.09
SE → Att.	231.81*	39	5.94	.83	.10	316.62	18.88
PC ←→ IN	211.28*	38	5.56	.85	.10	297.74	.00
Fast food							
Original Model	426.33*	42	10.15	.71	.14	506.27	212.58
PC → RE	305.16*	41	7.44	.80	.11	386.71	93.03
IN → RE	242.94*	40	6.07	.85	.10	326.12	32.43
PC ←→ IN	222.36*	39	5.70	.86	.10	307.17	13.48
SE → Att.	207.23*	38	5.45	.87	.09	293.69	.00

Table 6.11 continued

Health Behaviour	χ^2	*df*	χ^2/df	CFI	RMSEA	$AICc_i$	Δ_i
Soft drink							
Original Model	346.03*	42	8.24	.73	.12	425.97	162.42
IN → RE	271.93*	41	6.63	.79	.11	353.48	89.94
PC → RE	220.44*	40	5.51	.84	.09	303.62	40.07
SE → Att.	183.92*	39	4.72	.87	.09	268.73	5.18
PC←→ IN	177.09*	38	4.66	.88	.09	263.55	.00
Avoid sugar							
Original Model	404.87*	42	9.64	.67	.13	484.81	204.84
PC → RE	274.46*	41	6.69	.79	.11	356.01	76.04
IN → RE	215.61*	40	5.39	.84	.09	298.79	18.82
PC←→ IN	195.16*	39	5.00	.86	.09	279.97	.00

Note. CFI = comparative fit index, RMSEA = root mean squared error of approximation, AICci = Akaike information criterion (corrected) value for model i; Δi = AICci - minimum AICc value for the candidate set (Δi = 0 for model with minimum AICc value), → = causal relationship added to the integrated model, ←→ = variables allowed to covary in the integrated model (added), PC = perceived controllability, RE = response-efficacy, IN = injunctive norms, Att. = attitudes, DN = descriptive norms, SE = self-efficacy. * = $p < .001$.

Mediation analyses.

The mediational hypotheses of the proposed integrated model were investigated using hierarchical regression analyses and bootstrapped point estimates for the indirect effect (Baron et al. 1986; Preacher & Hayes, 2004, 2008). The integrated model predicted that the effects of severity, susceptibility, response-efficacy and threat and efficacy health knowledge on intentions would be mediated by attitudes; and the effects of perceived controllability, past behaviour and threat and efficacy health knowledge on intentions would be mediated by self-efficacy (see figure 5.1). Each of these relationships was investigated using hierarchical regression analyses. In all analyses the predictor variable was entered in the first step followed by the potential mediator variable in the second step. If the validity of the predictor variable is decreased in the second step, mediation is present (and if it is increased suppression is present). Although the Sobel test is often used to determine the significance of this change, it has some significant limitations

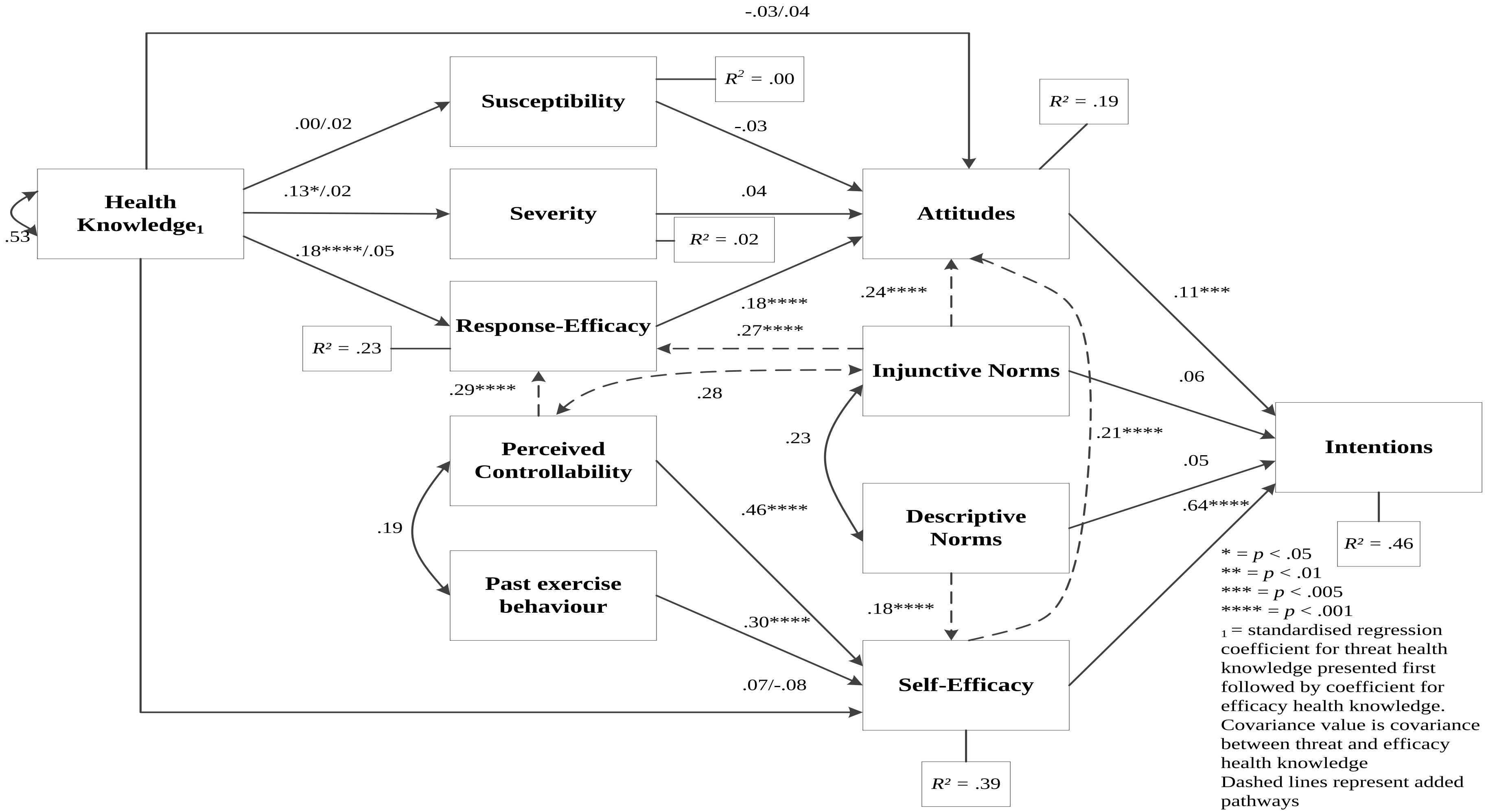

Figure 6.8. All modifications made to the integrated model predicting intentions to exercise 30 minutes per day five days per week: path model showing standardised beta coefficients for all proposed relationships (error terms removed for the sake of clarity).

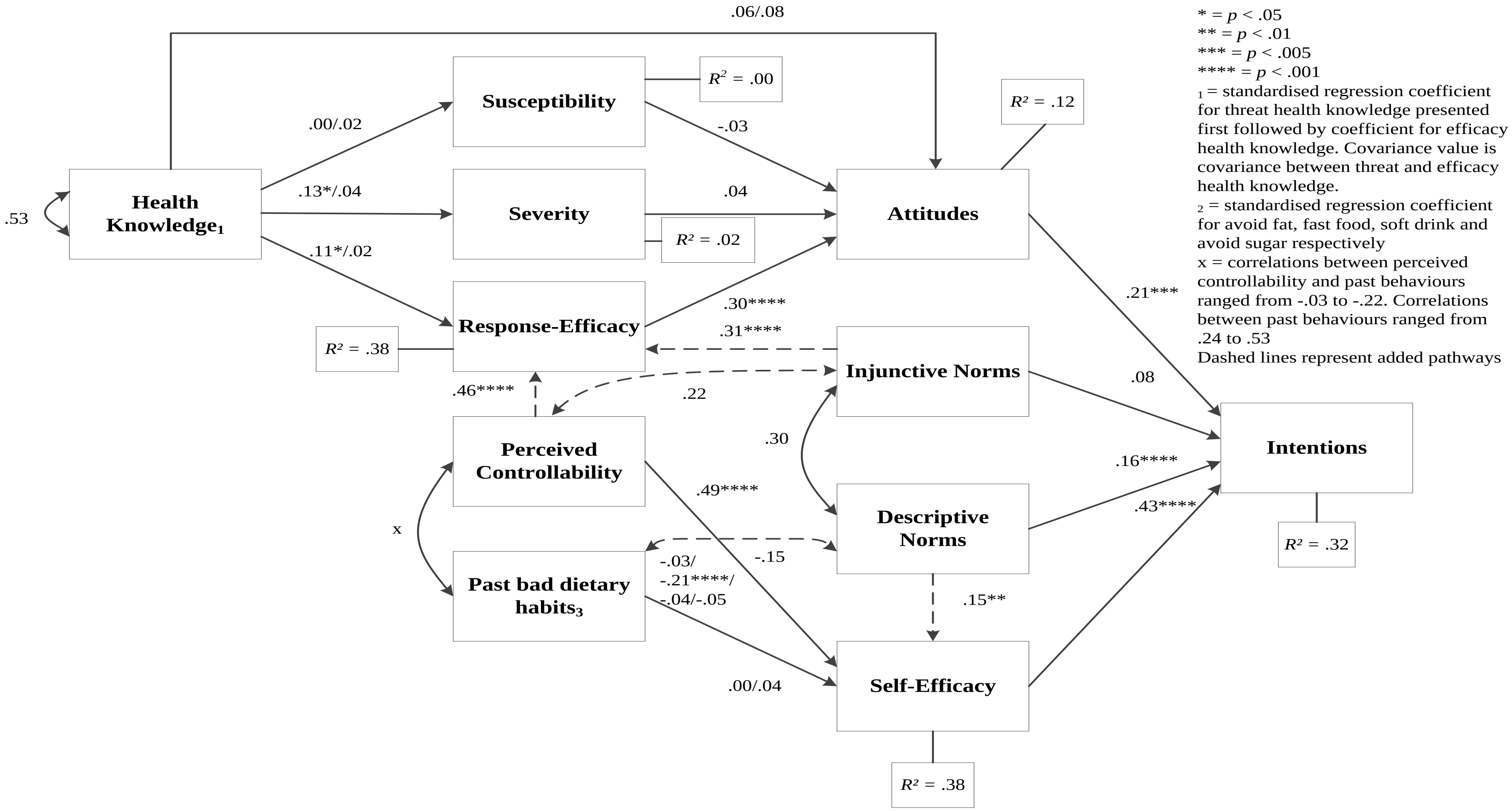

Figure 6.9. All modifications made to the integrated model predicting intentions to maintain a healthy diet: path model showing standardised beta coefficients for all proposed relationships (error terms removed for the sake of clarity).

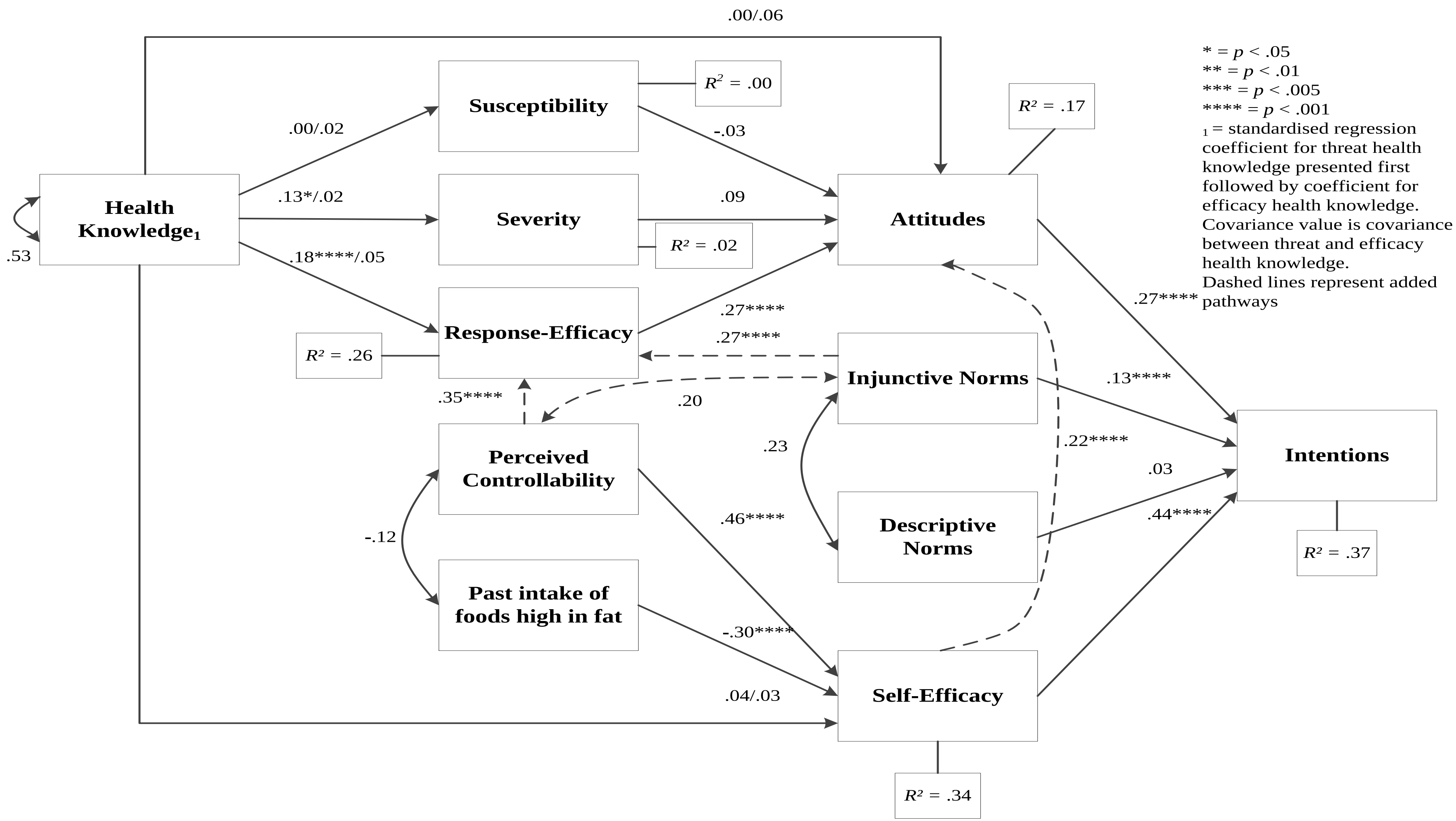

Figure 6.10. All modifications made to the integrated model predicting intentions to avoid foods high in fat: path model showing standardised beta coefficients for all proposed relationships (error terms removed for the sake of clarity).

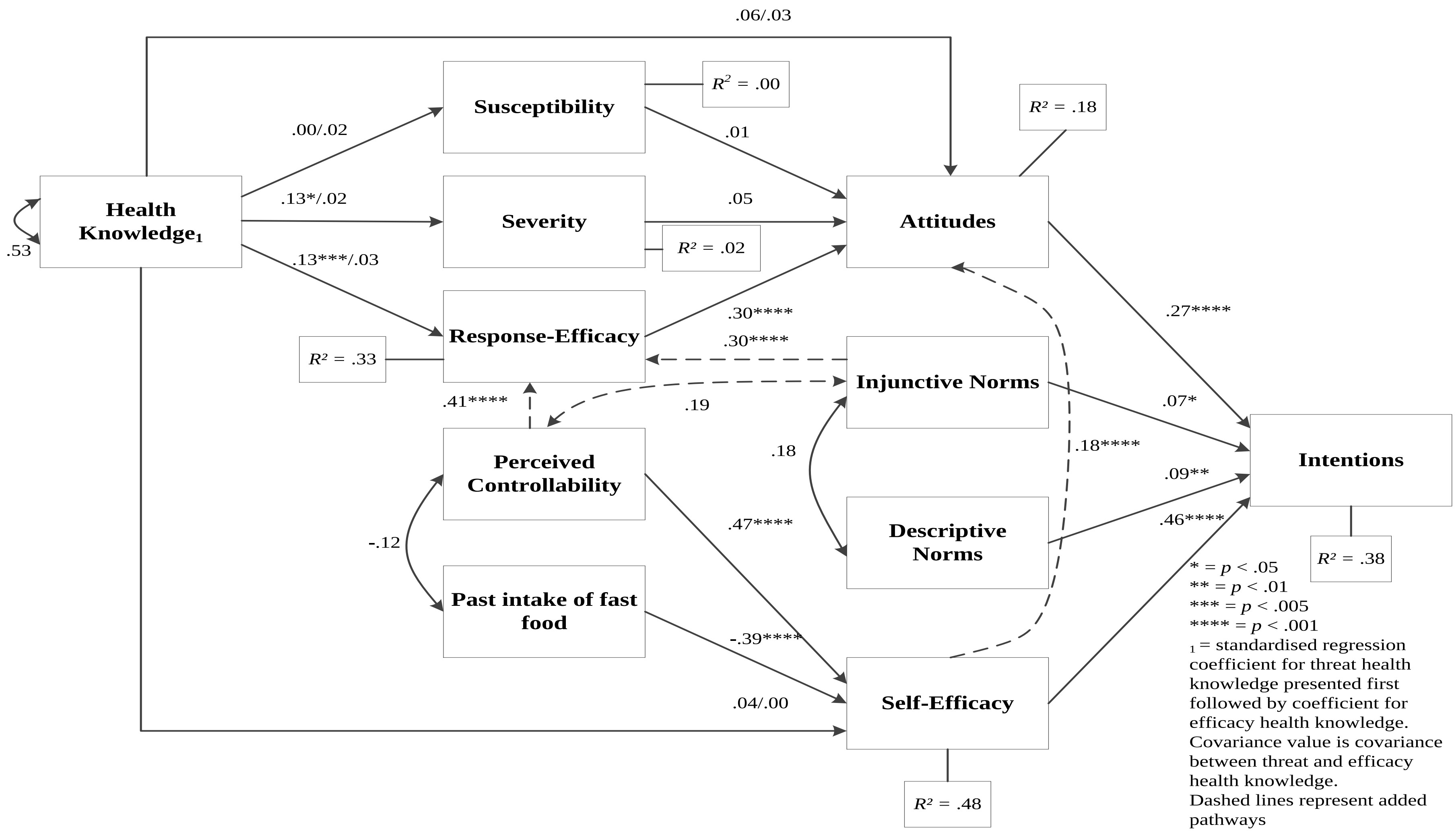

Figure 6.11. All modifications made to the integrated model predicting intentions to avoid fast foods high in fat: path model showing standardised beta coefficients for all proposed relationships (error terms removed for the sake of clarity).

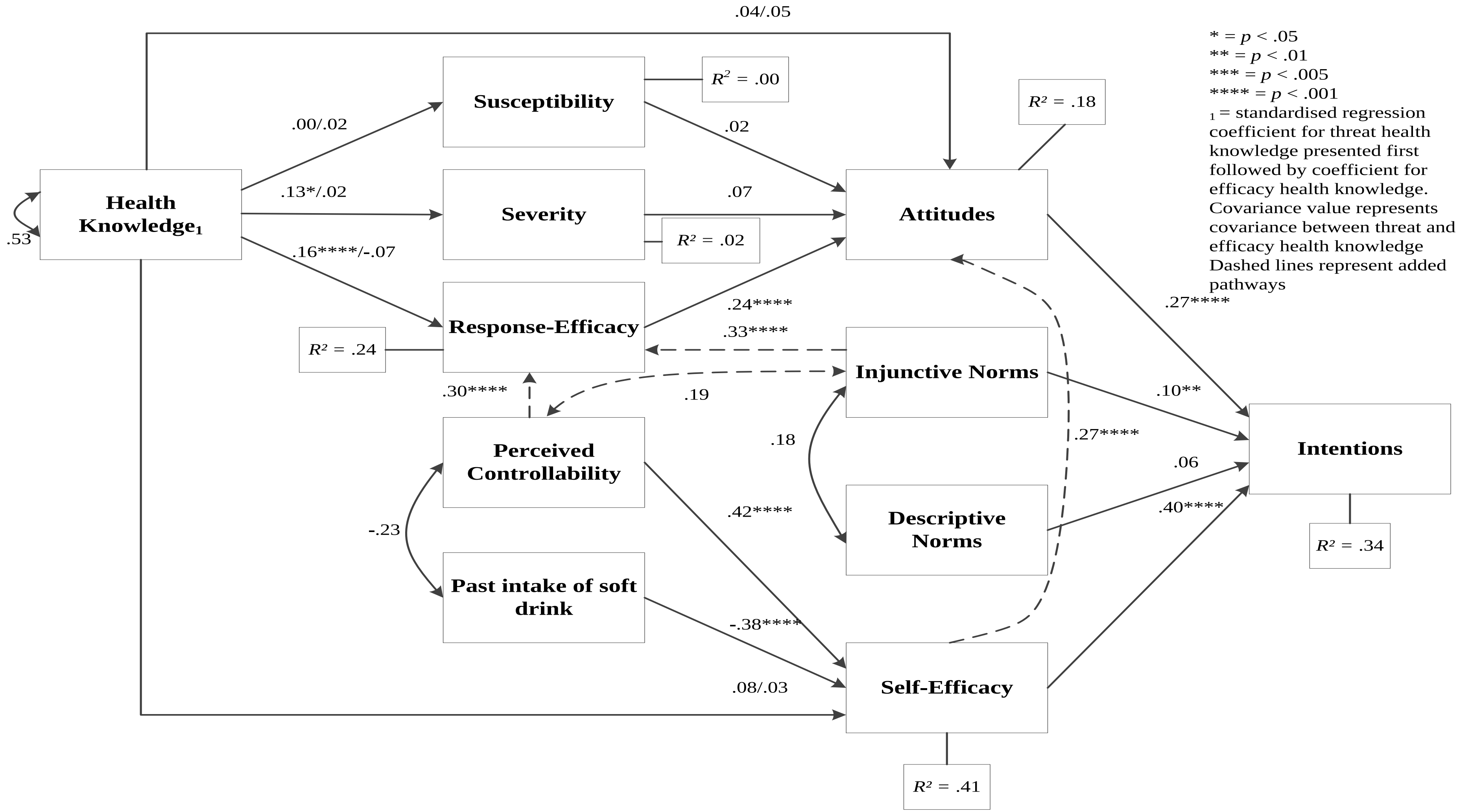

Figure 6.12. All modifications made to the integrated model predicting intentions to avoid soft drink: path model showing standardised beta coefficients for all proposed relationships (error terms removed for the sake of clarity).

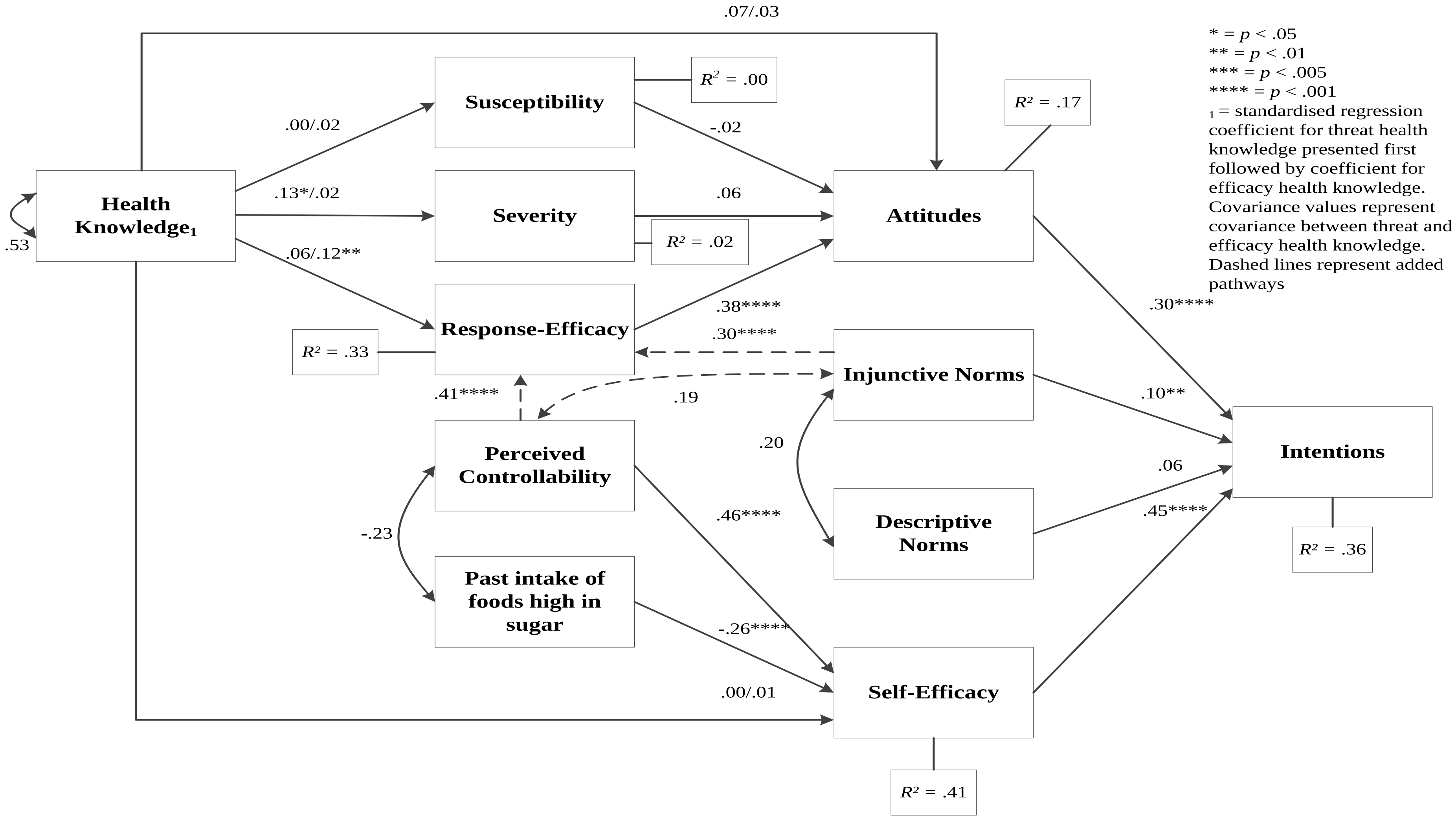

Figure 6.13. All modifications made to the integrated model predicting intentions to avoid foods high in sugar: path model showing standardised beta coefficients for all proposed relationships (error terms removed for the sake of clarity).

significant skewness and kurtosis unless samples are very large (Bollen & Stine, 1990; Hayes; Preacher et al., 2008; Stone & Sobel, 1990). As such, the Sobel test is underpowered for detecting mediation (and suppression) relative to the bootstrapping method; MacKinnon et al., 2002; Mackinnon et al., 2004). The Sobel test also does not control for the possible mediating (or suppressing) effect of other predictors in the regression model which are not proposed to be mediators (cf. Preacher et al., 2008). As such, the Hayes et al. (in press) bootstrapping method was applied instead (5000 bootstrapped resamples). Recall that this method allows for multiple independent and mediator variables and the effects of other predictors can be controlled (see Chapter 5). As such, this analysis can be used to investigate whether a mediation (or suppression) effect still holds in the context of a full regression model; as opposed to just in the three variable (predictor – mediator – outcome) case. A summary of all the mediation analyses is presented in table 6.12.

Mediating effect of attitudes. Contrary to expectations attitudes did not mediate the effect of susceptibility on intentions. Further, attitudes only mediated the effect of severity on intentions to avoid foods high in fat. In all other cases the indirect effect of severity on intentions was non-significant. Attitudes also did not mediate the effect of efficacy or threat health knowledge on intentions. However as predicted, attitudes were found to mediate the effect of response efficacy on intentions for all health behaviours investigated (see table 6.12).

Table 6.12

Direct Effects of Severity, Response-efficacy, Perceived Control, Past Behaviour and Threat and Efficacy Health Knowledge on Intentions Before and After Controlling for Mediating Variables, with Accompanying Bootstrapped Point Estimates 95% Confidence Intervals

Health Behaviour	β_{yx}	$\beta_{yx.m}$	Bootstrapping[1] Point Estimate	*SE*	95% CI Lower	95% CI Upper
SUSC (*x*) → ATT (*m*) → INT (*y*)						
Exercise 30 mins	-.11	-.15*	-.02	.02	-.05	.01
Healthy diet	-.01	-.03	-.01	.01	-.03	.01
Avoid fat	-.01	-.08	-.02	.02	-.05	.01
Fast food	-.03	-.09	-.01	.01	-.03	.02
Soft drink	.09	.06	-.01	.01	-.04	.02
Avoid sugar	.06	.03	.00	.01	-.03	.02
SEV (*x*) → ATT (*m*) → INT (*y*)						
Exercise 30 mins	.07	.03	.03	.02	-.002	.07
Healthy diet	.11*	.07	.01	.01	-.01	.04
Avoid fat	.15***	.07	.04†	.02	.01	.08
Fast food	.13***	.07	.02	.02	-.01	.05
Soft drink	.13***	.06	.03	.02	-.01	.08
Avoid sugar	.15***	.08	.02	.02	-.01	.05
RE (*x*) → ATT (*m*) → INT (*y*)						
Exercise 30 mins	.14***	.05	.18†	.04	.12	.27
Healthy diet	.26****	.16****	.13†	.03	.08	.20
Avoid fat	.28****	.15***	.15†	.04	.10	.24
Fast food	.36****	.24****	.14†	.03	.09	.22
Soft drink	.29****	.17****	.14†	.03	.09	.20
Avoid sugar	.32****	.19****	.16†	.03	.10	.24
PC (*x*) → SE (*m*) → INT (*y*)						
Exercise 30 mins	.32****	-.05	.44†	.04	.37	.53
Healthy Diet	.37****	.11*	.30†	.05	.21	.39
Avoid fat	.33****	.08	.26†	.05	.17	.36
Fast food	.38****	.10*	.25†	.06	.15	.38
Soft drink	.38****	.17****	.20†	.05	.11	.31
Avoid sugar	.37****	.16****	.22†	.05	.14	.32

Health Behaviour	β_{yx}	$\beta_{yx.m}$	Bootstrapping[1] Point Estimate	*SE*	95% CI Lower	Upper
PB (*x*) → SE (*m*) → INT (*y*)						
Exercise 30 mins	.38****	.12***	.17†	.02	.03	.22
Healthy diet[2]						
Fatty foods	-.18****	-.09*	-.01	.01	-.03	.01
Fast food	-.21****	-.02	-.12†	.03	-.19	-.07
Soft drink	-.16****	-.05	-.01	.01	-.03	.01
Sugary foods	-.14***	-.05	-.01	.01	-.04	.01
Avoid fat	-.27****	-.08*	-.05†	.01	-.08	-.03
Fast food	-.36****	-.10*	-.20†	.04	-.28	-.13
Soft drink	-.37****	-.16****	-.05†	.01	-.08	-.03
Avoid sugar	-.24****	-.10**	-.03†	.02	-.07	-.01
Threat HK (*x*) → ATT (*m*) → INT (*y*)						
Exercise 30 mins	.04	.02	.00	.01	-.02	.01
Healthy diet	.14***	.09*	.01	.01	-.01	.03
Avoid fat	.17****	.12***	.00	.01	-.02	.02
Fast food	.22****	.15****	.01	.01	-.01	.04
Soft drink	.18***	.11**	.01	.01	-.01	.04
Avoid sugar	.19****	.12***	.01	.01	-.01	.03
Efficacy HK (*x*) → ATT (*m*) → INT (*y*)						
Exercise 30 mins	-.03	-.04	.00	.00	-.01	.01
Healthy diet	.11*	.06	.01	.00	-.001	.02
Avoid fat	.13***	.08	.01	.01	-.003	.02
Fast food	.18****	.12***	.00	.00	-.01	.01
Soft drink	.18***	.12**	.00	.01	-.01	.02
Avoid sugar	.14***	.08*	.00	.00	-.01	.01
Threat HK (*x*) → SE (*m*) → INT (*y*)						
Exercise 30 mins	.04	.01	.04	.03	-.03	.11
Healthy diet	.14***	.07	.00	.02	-.03	.03
Avoid fat	.17****	.10**	.01	.02	-.02	.04
Fast food	.22****	.13***	.01	.01	-.01	.03
Soft drink	.18***	.09*	.01	.01	-.002	.04
Avoid sugar	.19****	.14****	-.00	.01	-.03	.03
Efficacy HK (*x*) → SE (*m*) → INT (*y*)						
Exercise 30 mins	-.03	.00	-.03	.01	-.06	.00
Healthy diet	.11*	.05	.01	.01	-.01	.02
Avoid fat	.13***	.07	.01	.01	-.01	.02
Fast food	.18****	.10**	.00	.01	-.01	.01
Soft drink	.18***	.07	.01	.01	-.003	.02
Avoid sugar	.14***	.11*	.00	.01	.01	.01

Note. *x* = predictor, *m* = mediator, *y* = outcome variable (in all cases intentions), β_{yx} = direct effect of predictor on intentions, $\beta_{yx.m}$ = direct effect of predictor on intentions after controlling for the mediator, SEV = severity, ATT = attitudes, RE = response-efficacy, PC = perceived controllability, SE = self-efficacy, HK = health knowledge, INT = intentions. [1] = point estimate and confidence intervals calculated using 5000 bootstrapped resamples, [2] = four separate measures of past behaviour used as predictors,* = $p < .05$, ** = $p < .01$, *** = $p < .005$, **** = $p < .001$, † = bootstrapped confidence interval does not contain zero, implying that decrease in magnitude of unstandardised regression coefficient of *x* as a result of *m* is different from zero (i.e., mediation).

Mediating effect of self-efficacy. As predicted, self-efficacy mediated the effect of perceived behavioural control on intentions for all six health behaviours investigated. Self-efficacy also partially mediated the effect of: past exercise behaviour on exercise intentions; past fast food intake on intentions to maintain a healthy diet; past intake of foods high in fat on intentions to avoid foods high in fat; past intake of fast food on intentions to avoid fast food; past consumption of soft drinks on intentions to avoid soft drinks high in sugar and past consumption of foods high in sugar on intentions to avoid foods high in sugar. Self-efficacy did not mediate the effect of either threat or efficacy health knowledge on intentions.

Discussion

The aims of this replication of Study 2 were to investigate the predictors of intentions to exercise and healthy dietary behaviours. Both the TPB and PMT-R were found to be useful models for explaining exercise and dietary intentions. However, on balance the TPB was shown to be the superior approximating model, explaining a greater proportion of the variance in intentions for all five dietary behaviours investigated, and a marginally smaller proportion of the variance in exercise intentions when compared with PMT. Protection Motivation Theory was found to explain between 27.5% and 49.8% of the variance in health behaviour intentions compared with 33.8% and 48.2% for the TPB. The predictions of the integrated model were also investigated but were only partially supported. Goodness of fit statistics revealed that path models derived from the predictions of the integrated model were a poor fit to the data for all six health behaviours investigated. Modifications made to these models significantly increased model fit, however only one model (maintaining a healthy diet) was an acceptable fit to the data. Nevertheless investigating the integrated model highlighted several interesting connections between constructs from PMT and TPB. Patterns of significant relationships were similar between health behaviours. As such, discussion of the results will be separated into discussing results which were consistent between all health behaviours followed by discussion of results which were found for only some of the health behaviours investigated.

Consistent Patterns of Results between Health Behaviours

Self-efficacy.

Self-efficacy was consistently found to be the strongest predictor for all exercise and dietary behavioural intentions investigated. This indicates that an individual's beliefs that they are capable of engaging in a particular behaviour are very important determinants of their intentions to engage in those behaviours. The consistency of this effect suggests that increased self-efficacy may be associated with increased uptake of a number of healthy behaviours. The strong effect of self-efficacy on health behaviour intentions is not unique to the current study. This effect is well established in health behaviour research (cf. Armitage et al., 2001; Floyd et al., 2000; Godin et al., 1996; Hagger et al., 2002; McEachan et al., 2011; Milne et al., 2000; Witte & Allen, 2000) and has been shown to be consistent across a wide variety of health behaviours including: exercise/physical activity (e.g., Bui et al., 2013; Hagger, Chatzisarantis & Biddle, 2001; Hagger et al., 2002; Hagger et al., 2005; Plotnikoff et al., 1995, 1998, 2002; Plotnikoff, Rhodes et al., 2009; Plotnikoff, Trinh et al., 2009; Rhodes et al., 2003; Wallace, 2002); dietary behaviours (e.g., Armitage et al., 1999a, 1999b; Hagger et al., 2005; Nejad et al., 2006; Povey et al., 2000a); quitting smoking (e.g., Godin et al.,1992; Maddux et al., 1983; Moan & Rise, 2006; Norman et al., 1999; van den Pute, Yzer, Willemsen & de Bruijn, 2009); breast self-examination (e.g., Hodgkins et al., 1998; Rippetoe et al., 1987; Seydel et al., 1990); attending cervical screening (Orbell et al., 1998); use of hearing protection devices (Melamed et al., 1996); calcium intake

(Wallace); and condom use (e.g., Abraham et al., 1994; Bengel et al., 1996; Van der Velde et al., 1991). These findings support the predictions of several models which include self-efficacy as a major determinant of intentions and behaviour including: the TPB (Ajzen, 1985, 1987, 1991), PMT-R (Rogers, 1983), EPPM (Witte, 1992) the Transtheoretical Model (Prochaska et al., 1992) and Social Cognitive Theory (Bandura, 1977a, 1986, 1998). Taken together these findings suggest that interventions targeting health behaviours should have increasing the target audience's self-efficacy as a major focus.

Protection Motivation Theory. In the PMT analyses self-efficacy was the only consistent predictor of intentions (response-efficacy was significant for all behaviours except exercise 30 minutes). Although perceived susceptibility registered a significant and positive β-value for all health behaviours, exploratory analyses revealed that it acted as a suppressor variable within each of the regression equations – in each case removing irrelevant variance in self-efficacy. As a result, the predictive validity of the regression models increased by including susceptibility as a predictor – despite its zero order bivariate association with intentions. This suggests that the effect of self-efficacy on intentions cannot be explained by those with high self-efficacy having low susceptibility.

These findings lend support to the findings of Study 2 in that coping/efficacy appraisal variables (i.e., self- and response-efficacy) were more important in determining health behaviour than threat appraisal variables (susceptibility and severity). Several studies have reported the superiority of the coping/efficacy appraisal variables over the threat appraisal variables in predicting health intentions and behaviour (e.g., Bui et al., 2013; Floyd et al., 2000; Hodgkins et al., 1998; Lippke et al., 2009; Maddux et al., 1983; Milne et al., 2000; Plotnikoff et al. 1995; Plotnikoff, Rhodes et al., 2009; Plotnikoff et al., 2010; Plotnikoff, Trinh et al., 2009; Rogers et al., 1976). However in contrast, in Study 2 response-efficacy was the more important predictor for many of the health behaviours (i.e., using nicotine replacement therapy [NRT]) rather than self-efficacy. An important difference is that each of the health behaviours investigated in the present study are relatively complex, requiring considerable effort over time to be successfully adopted. This is not the case for purchasing and using NRT which is relatively simple and effortless. Ajzen (1991) argues that PBC (i.e., including considerations of self-efficacy) will only be an important determinant of behaviours which are effortful or not under complete volitional control. As such, it makes sense that self-efficacy was a more important determinant of intentions to maintain specific exercise and dietary practices over time than for using NRT.

Theory of Planned Behaviour. Self-efficacy was also the most important predictor of intentions within the context of the TPB. As in Study 2, principle components analysis demonstrated that self-efficacy and perceived controllability were distinct constructs (see also Armitage et al., 1999a, 1999b; Terry et al., 1995; Trafimow et al., 2002). However, self-efficacy was clearly the better predictor of intentions of the two PBC constructs. Self-efficacy was a strong predictor of all six health behaviours investigated, and PBC was a relatively weak predictor of intentions to avoid soft drink only. A significant negative association was found between perceived controllability and exercise intentions within the TPB model. However, exploratory analyses suggested that this effect indicated that perceived controllability acted as a suppressor in the regression equation – increasing the predictive validity of self-efficacy. Similar results were found by Povey et al. (2000) suggesting that perceived controllability may have acted as a suppressor in their results as well (although the effect was not identified as such). Taken together these results lend support to previous findings which suggest that self-efficacy is a stronger predictor of health behaviour intentions than perceived controllability (e.g., Armitage et al., 1999a, 1999b; Hagger et al., 2002; Hagger et al., 2005; Povey et al., 2000a; Trafimow et al.).

Integrated Model. Predictors of self-efficacy included perceived controllability and past behaviour for each of the health behaviours investigated. Self-efficacy also partially (and in some cases fully) mediated the effect of both perceived controllability and past behaviour on intentions. These findings support the predictions of the integrated model which predicted that individuals' perceptions of self-efficacy with respect to a behaviour would be determined by their prior engagement in that behaviour and their belief that they have control over whether they adopt that behaviour. These results suggest that perceived controllability may be understood as a prerequisite determining perception of self-efficacy – and self-efficacy in turn determines intentions. To illustrate, an individual may believe that they are in control of whether they adopt an exercise program, but will only intend to adopt that program if they believe that they believe they possess the requisite skills, time and resources.

The results of this study also suggest that past performance of a behaviour enhances ones belief that they can continue to engage in that behaviour (cf. Bandura, 1977, 1982). Further, the effect of past behaviour on intentions was found to be partially mediated by self-efficacy. These findings support Ajzen's (2002b) contention that the effect of past behaviour on intentions should be mediated by other predictors of intentions. However, it should be noted that even after controlling for the effects of attitudes, and injunctive and descriptive norms, self-efficacy only partially mediated the effect of past behaviour on intentions. This indicates that past behaviour still exerts some residual direct effect on intentions. As such, the proposed integrated model may be mis-specified and further predictors of intentions may be necessary to fully mediate the effect of past behaviour on intentions (cf. Ajzen, 2002b).

Attitudes.

Individual's reported attitudes concerning each of the health behaviours were found to be the second strongest predictor of intentions (after self-efficacy). These findings indicate that individuals are more likely to engage in exercise and dietary behaviours when they believe that engaging in such behaviours will be associated with positive outcomes. These results lend support to a large number of findings in the TPB literature which suggest that attitudes are a robust predictor of behavioural intentions across a wide variety of health behaviours (cf. Armitage et al., 2001; Godin et al., 1996; McEachan et al., 2011).

A more interesting finding was that, as predicted by the integrated model, response-efficacy predicted attitudes for all six of the health behaviours investigated. Further, attitudes partially mediated the effect of response-efficacy on intentions (fully mediation was achieved for exercise intentions). This suggests that individual's belief that engaging in exercise and maintaining healthy dietary habits are associated with positive health outcomes is a salient behavioural belief determining attitudes. And further suggests that the PMT-R construct of response-efficacy may be subsumed by attitudes from the TPB. These findings support those found in Study 2, suggesting that the response-efficacy – attitudes relationship found is consistent across several health behaviours. However, it is important to note that much of the variance in attitudes was not explained by response-efficacy – only 10-17% of the variance was explained. This indicates that anticipated positive health outcomes are not the only considerations which determine one's attitudes concerning diet and exercise behaviours. Research employing belief-based measures of attitudes has found that beliefs concerning losing weight, changes in physical attractiveness, increased self-esteem, better health outcomes, decreased enjoyment or taste of healthy food and feelings of guilt each contributed to global measures of attitudes about adopting a healthy diet (cf. Ajzen, 1991; Ajzen & Madden, 1986; Armitage et al., 1999b, 1999c; Nejad et al., 2006). Taken together these findings suggest that although response-efficacy is an important determinant of attitudes, other behavioural beliefs may also determine diet and exercise attitudes.

Traditionally TPB research employs both global and belief-based measures of attitudes. Global measures are similar to those used in Studies 2 and 3 and generally use a semantic differential format (Ajzen, 1991; Fishbein & Ajzen, 2010). Several studies employ only global measures of TPB constructs (e.g., Courneya & Bobick, 2000; Hagger et al., 2001; Hagger, Chatzisarantis, Culverhouse & Biddle, 2003; Hamilton & White, 2008; Higgins & Conner, 2003; Rhodes et al., 2003). Belief-based measures involve generating a set of salient behavioural beliefs concerning the possible outcomes of a particular behaviour. This is most often achieved through pilot research. Participants are then asked how likely it is that a particular outcome will occur, and whether they believe that outcome to be positive or negative (e.g., “eating a low fat diet means eating boring food” [likely-unlikely; Armitage et al., 1999b, pp. 78]; “eating boring food is … “[bad-good]). According to the TPB, attitudes are determined by product of the likelihood of each outcome occurring and the individual’s subjective evaluation of each of these outcomes (Ajzen, 1991; Fishbein & Ajzen, 1975). Future research could employ pilot studies to determine salient behavioural beliefs in order to more fully explore the determinants of attitudes concerning healthy diet and exercise.

Findings Not Consistent across Health Behaviours

Variables other than self-efficacy and attitudes also found to predict intentions. However, these effects were less consistent across health behaviours. Further, these predictors were weaker than self-efficacy or attitudes. This suggests that intentions to adopt a healthy diet and exercise regularly are primarily determined by attitudes and self-efficacy – the other variables discussed in this section also determine intentions, but to a lesser extent.

Injunctive and descriptive norms were found to predict dietary behaviour intentions but not exercise intentions. This indicates individuals dietary intentions are more likely to be influenced by important other expectations or behaviour than exercise behaviours. However, the significant effects of injunctive and descriptive norms were much weaker than for attitudes or self-efficacy. A meta-analytic review of the TPB applied to exercise behaviour showed that subjective norms (β = .04) were a much weaker predictor of intentions than either attitudes (β = .30), perceived controllability (β = .27) or self-efficacy (β = .28; Hagger et al., 2002). McEachan et al's. (2011) meta-analysis found a similar pattern of results for exercise behaviour. Meta-analytic reviews suggest that subjective norms are also the weakest TPB predictor of dietary behaviours (McEachan et al.). However, subjective norms are a stronger predictor of dietary intentions (β = .23) than exercise intentions (β = .12; McEachan et al.). As such, the results found in the present study are consistent with those in previous research.

Past behaviour was found to explain unique variance beyond that explained by PMT for all six health behaviours investigated, and explained unique variance in intentions to: exercise 30 minutes per day five days per week, avoid fast food, avoid soft drink and avoid sugar. As such, this effect was robust across both theoretical model and the health behaviours investigated. Numerous studies have found a residual effect of past behaviour after controlling for both the TPB (cf. Conner et al., 1998; McEachan et al., 2011; Ouellette et al., 1998) and PMT-R (e.g., Abraham et al., 1994; Aspinwall, Kemeny, Taylor, Schneider & Dudley, 1991; Hodgkins et al., 1998; Van der Velde et al., 1991) constructs. Ajzen (1991) argued that past behaviour may be utilised to test the sufficiency of the TPB. It was argued that if the model is sufficient then past behaviour should not explain unique variance in intentions or behaviour when the effects of the TPB constructs are controlled. Similar logic can obviously be applied to other models. As such, it is likely that constructs from both the TPB and PMT-R may be inadequate in their description of the psychological factors which determine diet and exercise intentions. As such, further additions or amendments these models may be necessary to optimise the prediction of health intentions and behaviour.

Ajzen (2002b; see also Fishbein et al., 2010) argued that the effect that past behaviour exerts on intentions or behaviour is likely to be spurious. It is argued that the act of engaging in a particular behaviour in the past (regardless of its frequency) cannot cause a person to engage in (or intend to engage in) that behaviour in the future. Individuals do not clean their teeth today simply because they cleaned their teeth yesterday. Ouellette et al. (1998) argued that when a behaviour is repeatedly performed in a similar context that behaviour becomes habitual – it is performed automatically in the presence of the requisite situational cues without conscious deliberation. However, Ouellette et al.'s definition of habit strength is indistinguishable from frequency of past behaviour. As such, Ajzen (2002b pp. 110) argues that "using habit to explain the relation between prior and later behaviour involves circular reasoning: One infers the existence of a habit from the behaviour's temporal stability and then uses the inferred construct to explain the observed phenomenon." As there is no measure of habit strength independent of frequency of prior behaviour it adds little to posit the habit strength construct as a causal mechanism. The reasoned action approach argues that behaviour at both time points were determined by the same constructs – it is therefore little wonder that they are strongly correlated (Ajzen, 2002b; Fishbein et al., 2010). According to this approach researchers simply need to identify all the determinants of health behaviour intentions and the past behaviour – intentions link will disappear. Unfortunately such a model has yet to be realised.

Contrary to the predictions of PMT-R, threat appraisal variables did not explain unique variance in intentions. Severity was a non-significant predictor of intentions for all six health behaviours investigated and susceptibility acted as a suppressor variable. These findings echo several findings in the PMT-R literature which suggest that coping/efficacy appraisal is more strongly related to health behaviour intentions than threat appraisal (e.g., Bui et al., 2013; Lippke et al., 2009; Floyd et al., 2000; Hodgkins et al., 1998; Maddux et al., 1983; Milne et al., 2000; Plotnikoff et al. 1995; Plotnikoff, Rhodes et al., 2009; Plotnikoff et al., 2010; Plotnikoff, Trinh et al., 2009; Rogers et al., 1976). This indicates that individuals are not motivated to adopt a healthy diet or exercise by the perceived severity of weight-related illnesses or their perceived susceptibility to these illnesses. This finding is contrary to the logic behind fear appeal messages which aim to increase individuals' perceptions of severity and susceptibility in order to motivate behaviour change. These findings suggest that such strategies may be of limited usefulness when applied to diet and exercise behaviours.

Perceived severity was found to interact with self-efficacy to predict exercise intentions. When self-efficacy was high, severity was a positive predictor of intentions; but when self-efficacy was low, severity had no effect. This suggests that the perceived severity of weight-related health problems will only motivate an individual to exercise when they believe that they are capable of successfully maintaining an exercise regimen. When individuals believe they cannot maintain this regimen, perceptions of severity will not motivate action. This finding supports the predictions of PMT-R as self-efficacy moderated the effect of severity as predicted by the model (cf. Prentice-Dunn et al., 1997; Rogers, 1983). It also partially supports the predictions of the EPPM. However, the EPPM would predict that when self-efficacy was low a boomerang effect would occur, such that the individual becomes less likely to engage in exercise at higher levels of severity (cf. Witte, 1992; Witte & Allen, 2000). This is believed to occur as the individual experiences a further increase in fear which is not offset by the suggestion of the recommended response – therefore they respond with defensiveness.

Although this interaction effect is interesting, it was an isolated finding – no other threat*efficacy interaction effects were observed for any of the health behaviours investigated. This suggests that only the main effect of efficacy impacts on dietary intentions. The evidence for the threat by efficacy interaction effect is mixed in the PMT-R/EPPM literature (cf. Prentice-Dunn et al., 1997). Numerous studies have found the predicted interaction (e.g., Kleinot, 1982; Maddux et al., 1983; Plotnikoff, Rhodes et al., 2009; Rogers, 1985; Rogers et al., 1976; Self et al., 1990; Stephenson & Witte, 1998; Witte, 1992b; Witte et al., 1996; Wong et al., 2009), but others have not reported such an interaction (e.g., Mewborn et al., 1979; Mulilis & Lippa, 1990; Plotnikoff & Higginbotham, 1995; Plotnikoff, Trinh et al., 2009; Rippetoe et al., 1987; Rogers et al., 1970; Ruiter et al., 2003; Witte, 1992b). The predicted threat*efficacy interaction has only emerged in about half of the studies which have investigated the effect (Prentice-Dunn et al., 1997). The mixed results within the present study reflect these previous findings.

Health knowledge.

Threat health knowledge exerted no unique impact on exercise or diet intentions, its correlations with intentions were also weak. This suggests that knowledge of the health risks associated with overweight/obesity is not an important factor determining intentions to take action to reduce these risks. Participants may not have been motivated to adopt protective responses by threats to their health – as such knowledge of health risks was similarly non-motivating. This explanation is consistent with the finding that individual's perceived susceptibility and severity were either not associated or weakly associated with intentions for each of the health behaviours investigated. Individuals were more likely to be motivated by factors such as behaviour-relevant attitudes or self-efficacy. These findings suggest that informing individuals of the health risks associated with obesity may be of limited usefulness for motivating the uptake of exercise or healthy diet.

Efficacy health knowledge fared slightly better as a predictor of intentions. It was found to be a unique predictor of intentions to avoid foods high in fat and sugar within the context of the TPB, and was a unique predictor of intentions to avoid foods high in sugar within the context of PMT-R. These findings suggest that informing individuals about the effectiveness of preventative behaviours which may alleviate the health risk associated with increased weight may motivate them to make specific dietary changes such as avoiding foods high in fat and sugar. However, it is important to note that in all cases efficacy health knowledge was a relatively weak predictor of intentions, and the effects were inconsistent across outcome measures. Therefore, health promotion efforts aimed at changing exercise and dietary behaviours should not simply aim to inform the target audience about the benefits of adopting healthy behaviour; but should also aim to increase self-efficacy with regards to adopting those behaviours and generate positive attitudes about those behaviours.

Model comparison: PMT-R vs. TPB

Both PMT-R and the TPB were found to be useful models for explaining diet and exercise intentions. However, as predicted the TPB was found to be the superior model of the two. It was shown to be far superior to PMT-R for each of the dietary intentions and was roughly equivalent to PMT-R for explaining exercise intentions. Limited support was found for PMT-R as a whole: The effect of susceptibility and severity on intentions was either weak or non-significant and the predicted threat*efficacy interaction effect was only observed for exercise intentions. The best that can be said for PMT is that self- and response-efficacy were reliable predictors of intentions. The TPB fared somewhat better: Attitudes and self-efficacy were consistent predictors of intentions and injunctive and descriptive norms explained unique variance for each of the dietary behaviours. However, perceived controllability only explained unique variance in intentions to avoid soft drink. Its poor predictive validity is likely due to its shared variance with self-efficacy. In support of this, self-efficacy was found to mediate the effect of perceived controllability on intentions. These findings suggest that although both self-efficacy and perceived controllability predict intentions, self-efficacy is consistently the stronger predictor of the two. These findings support other research suggesting that self-efficacy is a stronger predictor of intentions that perceived controllability (e.g., Armitage et al., 1999a, 1999b; Hagger et al., 2002; Hagger et al., 2005; Povey et al., 2000a; Trafimow et al.).

Model comparison analyses revealed that the optimum model of intentions to exercise 30 minutes per day five days per week was PMT-R with the addition of health knowledge and past behaviour. This indicates that additional variables need to be added to PMT-R in order to optimise its prediction. For intentions to maintain a healthy diet the optimal model was the TPB with the addition of descriptive norms. For the remaining health behaviours the optimum model was the TPB with the addition of descriptive norms, health knowledge and past behaviour. Taken together these results suggest that both PMT-R and TPB may be incomplete accounts of the motivational factors underpinning health behaviour. As such, the addition of further factors to these models may lead to a more accurate prediction of health behaviour intentions and behaviour.

The Integrated Model

The present study found mixed support for the proposed integrated model. Recall that the proposed integrated model adopted predictions from the TPB, PMT-R and Maddux's (1993) extended TPB. Goodness of fit statistics suggested that the model was a poor fit to the data. However, due to the complexity of the models applied achieving a good fit was unlikely due to model fit statistics (especially the RMSEA) being sensitive to model complexity – penalising models with greater numbers of parameters (cf. Hooper, Coughlan & Mullen, 2008; Kline, 2005). Nevertheless, several interesting relationships between variables from the TPB and PMT-R were uncovered. Response-efficacy was found to predict attitudes and perceived controllability and past behaviour was found to predict self-efficacy. However, many of the predictions of the model were not borne out in the evidence.

Susceptibility and threat and efficacy health knowledge were not found to be significant predictors of attitudes as predicted by Maddux's (1993) model. Further severity only predicted attitudes concerning the avoidance of foods high in fat. As a result, the prediction of attitudes was suboptimal. Threat health knowledge was found to be weakly associated with severity and response-efficacy. This suggests that individuals with greater knowledge concerning the health outcomes associated with increased weight were more likely to rate these outcomes as severe, and were more likely to believe that protective responses are effective in reducing health risk. However, no such connection was found for susceptibility indicating that increased health knowledge does not translate into increased perceptions of susceptibility to weight-related health problems. Associations between self-efficacy and threat and efficacy health knowledge were also generally weak or non-significant. This indicates that contrary to predictions, increased health knowledge has little impact on individuals' self-efficacy with respect to diet and exercise behaviours.

Modifications to the Integrated Model.

The numerous negative findings and poor model fit suggested that the proposed integrated model was likely to be mis-specified. Therefore, modifications were made to the integrated model in order to explore further relationships between variables of the TPB and PMT-R. For each of the health behaviours investigated both perceived controllability and injunctive norms were added as predictors of response-efficacy. These findings support Rhodes et al. (2008) who found positive (albeit weak) associations between perceived controllability and response-efficacy and injunctive norms and response-efficacy. If individuals believe that people who care about them would like them to engage in a particular behaviour (injunctive norms), that individual may infer that they would like them to engage in this behaviour as it may be of some health benefit to them (high response-efficacy). The individual thus infers that others believe that a particular health behaviour is efficacious in reducing a health risk, suggesting that there is some validity to that notion – which in turn increases their own perceptions of response-efficacy with respect to that behaviour. Perceived controllability is more closely aligned conceptually with self-efficacy than response-efficacy. Nevertheless a plausible explanation for the association between response-efficacy and perceived controllability is that if an individual believes that they have some control over performing a behaviour it is more likely to be perceived as a viable and effective response to a health threat. An alternative explanation is that the association between perceived controllability and response-efficacy simply reflects perceived controllability being correlated with the shared variance between self-efficacy and response-efficacy. However, this is unlikely to be a full explanation as the bivariate associations between perceived controllability and response-efficacy were moderate-large (*r*s between .34 and .55) and were actually stronger than the associations between self-efficacy and response efficacy (*r*s between .23 and .35; see tables 6.1-6.6). Allowing perceived controllability and injunctive norms to covary also improved model fit for all health behaviours investigated. This finding is consistent with reseach and meta-analytic reviews which suggest that these variables are at least weakly correlated in TPB research (e.g., Hagger & Chatzisarantis, 2005; Hagger et al., 2002b; McEachan et al., 2011; Rhodes et al.).

Modification indices also highlighted other relationships between variables which improved model fit for some, but not all of the health behaviours investigated. One such relationship was the pathway between descriptive norms and self-efficacy which improved model fit for exercising 30 minutes per day five days per week and maintaining a healthy diet. This finding is consistent with previous research which has found positive associations between descriptive norms and self-efficacy (e.g., Hagger & Chatzisarantis, 2005; Rhodes et al., 2008). This relationship suggests that individuals are more likely to believe that they can maintain healthy exercise and dietary habits when others who are important to them have been able to do so. Perhaps individuals hold a belief something like “if they can do it, so can I” which bolsters their self-efficacy. They may also have observed important others maintaining these healthy habits and by doing so obtained some strategies for engaging in these behaviours themselves. This interpretation is consistent with the predictions of Social Cognitive Theory which suggests that individual’s self-efficacy with respect to performing a behaviour can be bolstered by observing similar others – learning how to engage in these behaviour through vicarious experience (cf. Bandura, 1977a, 1982, 1998).

Adding a pathway between self-efficacy and attitudes also improved model fit for many health behaviours (i.e., exercising for 30 minutes per day five days per week and avoiding foods high in fat, fast food and soft drink). This finding suggests that individuals are more likely to hold a positive attitude concerning perfoming a health behaviour when they also believe that they will be able to successfully adopt that behaviour. These findings support previous research suggesting that self-efficacy and attitudes are positively correlated (e.g., Hagger & Chatzisarantis, 2005; Hagger et al., 2002; Rhodes et al., 2008). A possible interpretation of these findings is that individuals may anticipate a boost in their self-esteem as a result of successfully engaging in a healthy behaviour. Conversely, when self-efficacy is low individuals may engage in motivated reasoning concluding that engaging in the healthy behaviour is not a good idea after all (cf. Kunda, 1990; Keller, 1999; Witte, 1992a). Holding such beliefs serves to protect the individual from the reduction in self-esteem which may result from failure to successfully adopt the healthy behaviour. Further, an individual who perceives that engaging in a behaviour will be relatively easy may tend to believe it is more enjoyable than an individual who anticipates failure or significant difficulty and strain with adopting the behaviour. It is also possible that individuals have high self-efficacy precicely because they are already engaging in the healthy behaviour (cf. Bandura, 1977a, 1982, 1998) – and as such individuals are motivated to hold positive attitudes about the behaviour as it is consistent with their behaviour (cf. Keller, 1999; Kunda, 1990). Attitudes are an outcome measure witin the EPPM which predicts that they are, in part, determined by perceptions of self-efficacy. It is argued that individuals are most likely to hold positive attitudes about engaging in a healthy behaviour when they believe that they are susceptible to a serious health threat and believe they are capable of taking effective action to reduce that threat (Witte). Taken together these findings demonstrate that theoretical integration can be utilised to explore and discover new relationships between constructs across existing health behaviour models.

Limitations of Studies 2 and 3

Given the correlational/cross-sectional design of Studies 2 and 3, the relationships found in these studies cannot be assumed to be causal. Experimental or longitudinal designs could be employed to better establish causality. Another limitation of these studies may be the use of intentions as the primary outcome measure in lieu of a specific measure of behaviour. Although many socio-cognitive models (including TPB and PMT-R) assume that intentions are the proximal predictor of behaviour (Ajzen, 1985; Rogers, 1983), this assumption has often been called into question (e.g., Rhodes & Dickau, 2012; Rhodes et al., 2008; Sheeran, 2002). Sheeran compiled several meta-analytic results concerning the relationship between intention and behaviour and found that the relationships were varied ranging from r = .40 to r = .82. Intentions were found to explain, on average, only 28% of the variance in behaviour. This suggests that individuals self-reported intentions do not necessarily translate into behaviour. Future research could employ a longitudinal design to ascertain the extent to which intention predicts subsequent behaviour in an integrated model (see Chapter 7).

Another limitation of both Study 2 and Study 3 may be that even utilising constructs from two models may be too restrictive. In order to gain a fuller understanding of the relationships between constructs from different models in the health behaviour literature we need to consider constructs from a number of models at once. This may allow for the predictions of several health behaviour models to be incorporated into a single integrated model – increasing our understanding of the relationships between constructs across theoretical models while also increasing the predictive and explanatory power of current health behaviour theories. The results of Study 2 and Study 3 suggest that both of these aims may be achieved when two models are integrated. It is therefore likely that if other models were integrated it would result in similar increased understanding of health-related intentions and behaviour. Further augmentation of existing theory is necessary in order to gain a fuller understanding of the factors which predict health behaviour change. This may be achieved through the use of research methodologies which employ theoretical integration (cf. Hagger, 2009, 2010).

Chapter 7: Study 4 - Development and Testing an Integrated Model of Fear Appeal Outcomes

Using the integrated model as a basis, Studies 2 and 3 established links between variables from two health behaviour models: PMT-R and TPB. However, it was argued that considering the vast array of models applied to the prediction of health behaviour an integrated model using just two models for its basis may be too restrictive (see Chapter 6). Study 4 aims to investigate the utility of combining predictions of four health behaviour models: the EPPM (Witte, 1992a), TPB (Ajzen, 1985, 1987, 1991), RPA (Rimal, 2001; Rimal et al., 2003) and Stage Model (Das et al., 2003; de Hoog et al., 2005, 2007, 2008) to yield a model which can explain the relationships between constructs from these models and responses to a fear appeal message – the Extended Integrated Model (EIM).

Explication of the Extended Integrated Model

The current research aims to test the predictions of the EIM: a model developed for this study which incorporates the predictions of the EPPM, Stage Model, RPA and the TPB. The EIM retains many of the predictions of the integrated model tested in Studies 2 and 3 but extends the scope of that model to explain responses to a fear appeal message. If no health message is presented as a cue to action the EIM can be used to predict behaviour and intentions on the basis of socio-cognitive predictors alone. The EIM is designed to predict a number of possible fear appeal outcomes including individuals' attitudes, intentions and behaviour, maladaptive responding to a fear appeal message (i.e., defensive avoidance, message derogation and perceived manipulation), the types of thoughts generated from the health message and changes in individuals health knowledge. The model predicts that responses to a fear appeal message will be moderated by the content of the message and the psychographic characteristics of its respondents. A schematic diagram of the EIM summarising its predictions is provided below in figure 7.1.

Psychographic groups

Rimal (2001) identified four types of individuals on the basis of their existing threat and efficacy perceptions: responsive, proactive, avoidant and indifferent. These psychographic groups have been investigated in subsequent RPA research and differences in responding between groups have been established (see Chapter 2; cf. Rimal, 2001; Rimal et al., 2003; Rimal Böse et al., 2009; Rimal Brown et al., 2009; Turner et al., 2006). Drawing on these findings, the EIM proposes that these four groups will differ in terms of their threat and efficacy perceptions, prior health behaviour, health knowledge, attitudes, intentions and in how they respond to a health message.

Responsive individuals have high perceptions of both threat and efficacy (Rimal, 2001). They believe that they are susceptible to a health threat, but believe they are capable of adopting responses they believe will be effective in alleviating the risk to their health. Therefore, they are likely to be motivated to, or are already engaging in health protective behaviour (cf. Rimal, 2001; Rimal et al., 2003; Rimal Böse et al., 2009; Rimal Brown et al., 2009; Turner et al., 2006). Proactive individuals are those whose perception of threat is low but their efficacy is high. According to the RPA, these individuals have low perceptions of threat precisely because they are already engaging in healthy behaviours – they believe they are not at risk as they believe that they have taken appropriate action to alleviate their risk (Rimal et al., 2003). Perceptions of efficacy are high in proactive individuals as they are currently engaging in health protective behaviour, so believe that they will be capable of doing so in the future (cf. Bandura, 1977a, 1982).

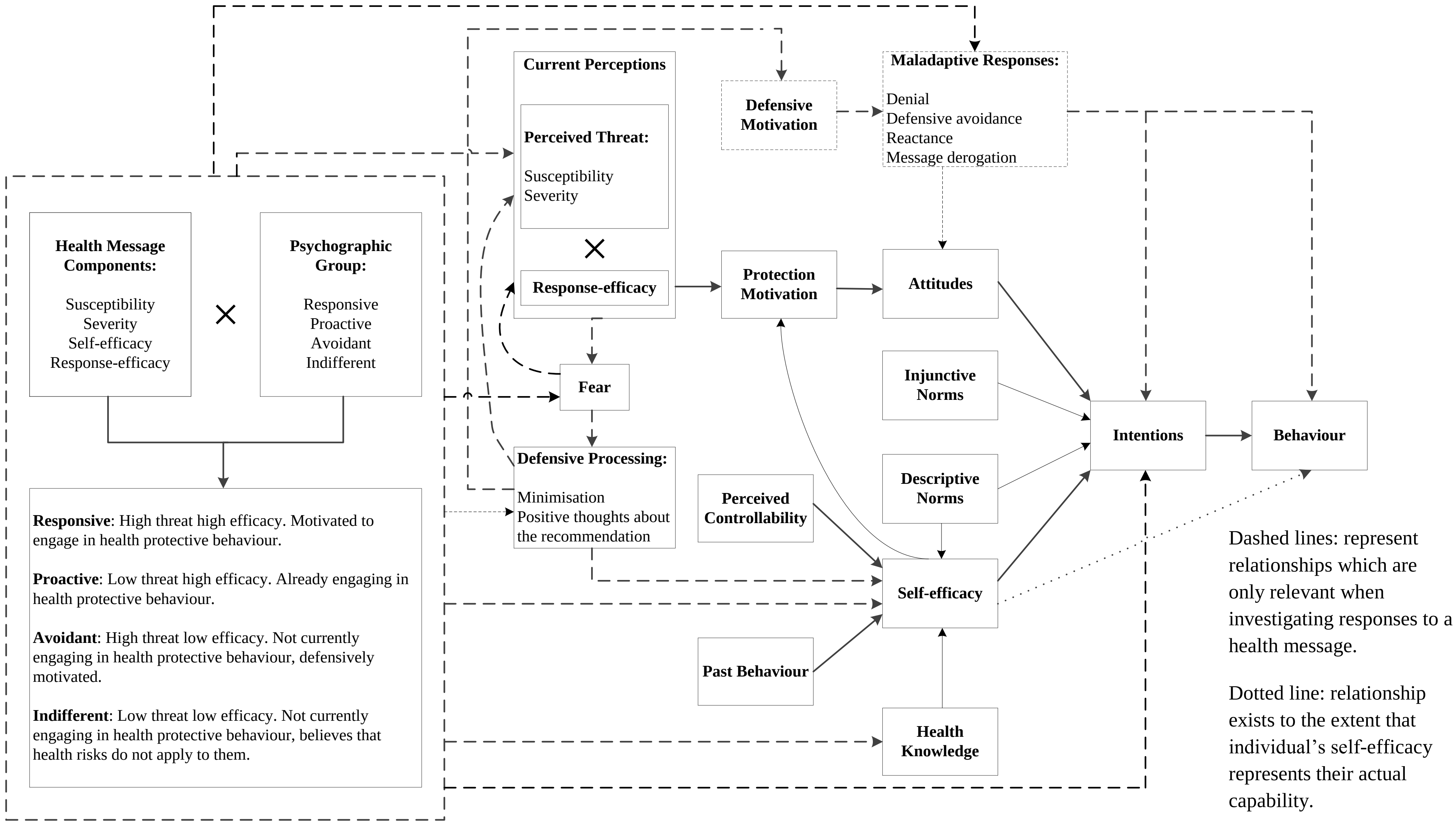

Figure 7.1. Schematic diagram of the Extended Integrated Model (Study 4).

Avoidant individuals are those with high perceptions of threat but low efficacy. Therefore, they accept that they are susceptible to a health threat but believe that they cannot take effective action to alleviate that threat. Therefore, rather than adopting health protective behaviour, they cope by avoiding thinking about the health threat or engaging in other defensive processes (cf. Witte, 1992a). Avoidant individuals are the most likely to adopt fear control responses such as denial or risk, defensive avoidance, reactance or message derogation in response to a threatening health message (cf. Leventhal, 1970, 1971, Witte). Indifferent individuals have low perceptions of both threat and efficacy (Rimal, 2001; Rimal et al., 2003). They are unconcerned by the health threat and, as a result, are not motivated to adopt protective responses (Rimal). These are individuals who may actually be at risk of a health problem; but fail to accept or recognise this risk. As a result, they have not sought to develop the requisite skills to adopt health protective behaviour. This is likely to be a problem when specific behavioural responses are necessary to reduce ones risk of developing health problems – as is the case with many chronic diseases. For example, individuals' risk of developing type 2 diabetes, coronary health disease and stroke increase if they are physically inactive and maintain a poor diet (e.g., AIHW, 2012; Mente et al., 2009; OECD, 2011; Warburton et al., 2006; WHO, 2000; Williams, 2001).

Health message components and psychographic group and their impact on perceptions of fear, threat and efficacy, and adaptive and maladaptive responses

The EIM adopts the assumption of the EPPM that components of a health message will impact on individual's perceptions of threat and efficacy. Specifically, those who view a high threat message should increase their perceptions of fear, susceptibility and severity, and those who view a high efficacy message should increase their perceptions of self- and response-efficacy (the opposite should be true for low threat and low efficacy messages; cf. Witte, 1992a). Also similar to the EPPM, the EIM maintains that responses to a fear appeal message can either be adaptive (i.e., attitude, intentions or behaviour change) or maladaptive (i.e., defensive avoidance, reactance, message derogation; cf. Leventhal, 1970; Witte, 1992a). It is proposed that individuals who view a high threat high efficacy message will hold the most positive attitudes and strongest intentions to engage in health protective behaviour. The EPPM also predicts that high threat low efficacy messages will lead to increased maladaptive responding (Witte, 1992; Witte et al., 2000). However, individuals are not presented the health message in a vacuum – they have psychographic characteristics which may also affect how they are likely to respond to the health message and under what conditions they are likely to adopt an adaptive response (i.e., attitude, intention and behaviour change; cf. Rimal, Brown et al., 2009). RPA research suggests that responsive and proactive individuals are the most likely to have more positive attitudes and intend to engage in health protective behaviour when compared with avoidant and indifferent individuals (e.g., Rimal et al., 2003; Rimal, Brown et al., 2009; Turner et al., 2006). The EIM maintains these predictions, but also makes additional predictions concerning how individuals' psychographic characteristics will interact with message components to determine adaptive and maladaptive responses to a fear appeal message.

The EIM proposes that the health message components and the individuals' existing psychographic characteristics will interact to determine their perceptions of threat and efficacy. It is proposed that proactive individuals are unlikely to accept that their health is at risk as a result of a health message as they are already adhering to its health protective recommendations. Their perceptions of efficacy should also remain stable as they are likely to have experiential evidence to suggest that they are capable of engaging in health protective behaviour and believe that this behaviour is effective in reducing their health risk. They have a vested interest in holding this belief as it is consistent with their choice to engage in health protective behaviour (cf. Keller, 1999; Kunda, 1990). They have also likely observed the benefits of their behaviour (e.g., increased cardiovascular fitness, weight loss). Therefore, proactive individuals' perceptions of both threat and efficacy should remain stable regardless of the components of a presented health message. As a result, they should maintain positive attitudes and strong intentions to engage in health protective behaviour in the future.

According to the EIM, responsive individuals will show no changes in threat perceptions regardless of the intensity of the threat message. Responsive individuals already have high perceptions of threat; therefore there is limited room for further increases in perceived threat. However, it is proposed that responsive individuals' perceptions of efficacy will be subject to change. Responsive individuals have less experiential evidence that they can adopt or maintain health protective behaviour over time and that these behaviours are effective in reducing their health risk when compared with proactive individuals. As a result, they may be more susceptible to counterarguments than proactive individuals. Therefore, it is proposed that responsive individuals' perceptions of efficacy will remain unchanged following a high efficacy message, but may be reduced following a low efficacy message. As a result, responsive individuals should have more positive attitudes and stronger intentions when presented with a high efficacy message than when presented with a low efficacy message.

Avoidant individuals' perceptions of threat are already high. As such, it is unlikely that their perceptions of threat will increase further in response to a high threat message. However, avoidant individuals' existing perceptions of efficacy are low – they believe that they cannot take effective action to alleviate the health threat. Therefore, a high efficacy message which highlights the effectiveness of health protective responses may serve to increase perceptions of efficacy in avoidant individuals (cf. Witte, 1992a; Rimal, Brown et al., 2009). As a result, their attitudes should become more positive and their intentions stronger following the presentation of a high efficacy message. Individuals who perceive high levels of threat and low levels of efficacy (i.e., avoidant individuals) believe that they are susceptible to a severe health threat, but believe that they cannot take effective action to overcome that threat. This reduces their motivation to adopt health protective responses, and increases their fear and anxiety about the threat (cf. Witte, 1992a). In order to reduce this fear, avoidant individuals may engage in maladaptive responses such as defensive avoidance or reactance (cf. Gore & Bracken, 2005; Witte; Witte et al., 1996). As such, the EIM predicts that avoidant individuals should be more likely to engage in maladaptive responses than responsive, proactive or indifferent groups. Further, as perceptions of threat are already high in avoidant individuals, highly threatening health messages may lead to further increases in fear (by making this threat salient) – resulting in an increase in maladaptive avoidance responses (cf. Gore et al.; Witte et al., 1996). This effect will be particularly pronounced if the high threat message is coupled with a low efficacy message – as the low efficacy message is not likely to increase the individual's confidence that they can take effective action to alleviate the threat. Therefore, avoidant individuals will engage in greater maladaptive responses in response to a high threat low efficacy message. Therefore, the EIM predicts that low threat high efficacy messages will be most effective in motivating health protective responses in avoidant individuals – as such messages should not lead to further defensiveness and should result in an increase in perceptions of efficacy (cf. Rimal, 2001; Rimal, Brown et al., 2009).

Indifferent individuals have low perceptions of both threat and efficacy. As a result, they also tend to have less positive attitudes and weaker intentions to engage in health protective behaviour (e.g., Rimal et al., 2003; Rimal, Brown et al., 2009; Turner et al., 2006). There is room for perceptions of threat and efficacy to be increased in indifferent individuals. Therefore, indifferent individuals' perceptions of threat and efficacy may be increased in response to a high threat or high efficacy message respectfully (cf. Witte, 1992a). As a result, indifferent individuals' attitudes should become more positive and their intentions stronger following a high threat high efficacy message.

Health message components and psychographic group and their impact on health knowledge

The integrated model predicts that the avoidant and the indifferent groups are the groups most likely to potentially benefit from the presentation of a health message – i.e., they are most likely to be currently engaging in unhealthy behaviours. Unfortunately these individuals may also be less likely to attend to the health message or engage with the health issue. In Study 2 of Rimal et al's (2003) research it was found that indifferent individuals believed that sun protection was a less salient issue and were less likely to seek information about sun protection when compared with the responsive group. Rimal, Brown et al. (2009) found that health knowledge was greater around HIV/AIDS for responsive and proactive individuals when compared with the avoidance and indifferent groups. Further, Turner et al. (2006) found that both avoidant and indifferent groups acquired less health information from health messages when compared with the responsive group. Evidence suggested that those in the avoidant group were motivated to gather information but their capacity to retain that information was impeded by their anxiety concerning the health issue. In contrast, it is likely that indifferent individuals failed to retain the information as it was perceived to be of little relevance. These findings suggest that although avoidant and indifferent individuals are most likely to benefit from health messages, they may lack the capacity or motivation to process and retain the health information. As a result these individuals will tend to have poorer health knowledge.

As responsive and proactive individuals are likely to already possess high levels of health knowledge (Rimal, Brown et al., 2009; Rimal et al., 2003; Turner et al., 2006), it is unlikely that they will gain significant health knowledge through the presentation of a health message. Avoidant and indifferent individuals are likely to have poorer baseline knowledge, but this means that their health knowledge could improve if they attend to a health message. Turner et al., (2006) demonstrated that avoidant individuals are motivated to gain health knowledge, but their capacity to do so was constrained by higher fear. No such effects were found for the other groups. As such, messages which reduce (or at least do not increase) fear should increase avoidant individuals' capacity to process health information and in turn increase their health knowledge. Therefore, the EIM predicts that avoidant individuals will gain greater health knowledge when presented with a low threat or high efficacy message. High threat or low efficacy messages will serve to increase fear resulting in poorer health knowledge. Turner et al. found that indifferent individuals have little motivation to process health information. This may be because these individuals perceive the information to be irrelevant to them (cf. Rimal et al., 2003). As such, the EIM predicts that indifferent individuals will not gain health knowledge following the presentation of a health message, regardless of its threat or efficacy content.

Health message components and psychographic group and their impact on defensive message processing

According to the Stage Model, those who perceive themselves to be susceptible to a severe health threat will engage in greater defensive processing (de Hoog et al., 2005, 2007, 2008). According to the model, defensive processing includes either minimising the threat (e.g., “that’ll never happen to me”) or expressing positive thoughts about a protective response (e.g., “regular exercise is a great way to lose weight”). As such, the model predicts that those exposed to a threatening message will generate more minimising thoughts. However, the EIM makes additional predictions. It is proposed that the avoidant group will generate the greatest number of minimising thoughts in response to a high threat message. These individuals have a vested interest in holding the belief that their health risk is less than depicted in the health message – holding this belief serves to reduce their fear, and is consistent with their decision to not engage in health protective behaviour (cf. de Hoog et al., 2007; Keller, 1999; Kunda, 1990; Witte, 1992a). Avoidant individuals will tend to engage in defensively motivated processing of the message as this helps them reach their preferred conclusion: that they are not at increased risk for severe health consequences (de Hoog et al., 2005, 2007, 2008).

It is proposed that those exposed to a high efficacy message will generate more positive thoughts about the recommendation. Such messages make the argument more strongly that health protective responses are effective – as such they should naturally be associated with the generation of more positive thoughts about the recommendation. The EIM further predicts that this effect will be most pronounced in responsive individuals. These individuals have a vested interest in holding the belief that the recommended response will be effective in reducing their health risk – holding this believe serves to justify their decision to engage in health protective behaviour and reinforces that effective action can be taken to alleviate their health risk (cf. Keller, 1999; Kunda, 1990). This is another form of defensively motivated processing of the message as it helps responsive individuals reach their preferred conclusion: that they can reduce their health risk through an appropriate change in their health behaviour.

Relationships between fear, defensive message processing and perceptions of threat and efficacy

Similar to the EPPM, the EIM proposes that individual's current perceptions of threat and efficacy will ultimately determine how they will respond to a health threat (cf. Witte, 1992a). The EIM also maintains the EPPM's predictions concerning fear (i.e., the individual's perceptions of threat elicit fear, and this fear becomes a motivator for action). Further, if individuals believe that no effective action can be taken to reduce the health threat (i.e., low response-efficacy) there should be a further increase in fear (cf. Witte). This increase in fear should then lead to a further increase in perceptions of threat. This is because a health problem which is unable to be effectively controlled through the adoption of the recommended response will likely be perceived as more threatening than a health problem which is controllable (cf. Witte). Therefore, the integrated model predicts that high perceptions of threat and high threat/low-efficacy will be associated with increased fear.

The integrated model adopts the additional prediction of the Stage Model that individuals should engage in defensively biased information processing of a threatening health message (i.e., by minimising the health threat, cf. de Hoog et al., 2005, 2007, 2008). It is proposed that this defensively biased information processing will have an effect on individuals' perceptions of fear, threat and efficacy. In contrast to the Stage Model, the EIM posits that perceptions of fear (rather than susceptibility) should motivate defensively biased information processing. The Stage Model assumes that individuals engage in defensively-biased information processing of threatening health information because this information “threatens their self-definitional belief that they are healthy” so they engage in this defensive processing to maintain their preferred conclusion that they are healthy (de Hoog et al., 2007, pp. 262). To date, this assumption of the model has not been specifically tested. Another (perhaps simpler) explanation is that when individuals feel susceptible to a severe health threat they become fearful, and this fear motivates them to process threatening information defensively. This explanation has the advantage of being easily testable and having a solid empirical basis (e.g., Cho, 2003; Witte, 1992a, 1992b, 1994; Witte & Allen, 2000). Research has established that when individuals experience fear as a result of a health message they often respond defensively (e.g., Abraham et al., 1994; Cho, 2003; Janis et al., 1953; Janis et al., 1962; Ruiter et al., 2003; Witte, 1992a, 1992b, 1994; Witte & Allen, 2000). As such, it is proposed that a threatening health message will elicit fear in respondents which in turn will motivate them to engage in defensively biased information processing in an attempt to reduce this fear.

According to the EIM, individuals who are threatened by the health message will experience fear, which will motivate them to engage in a biased search for inconsistencies and ways of invalidating the health message (cf. Chaiken et al., 1996; Chaiken et al., 1989; Chen et al., 1999; Das et al., 2003; de Hoog et al., 2005, 2007, 2008; Liberman et al., 1992). Individuals will then re-evaluate their perceptions of threat in light of this biased message processing. Although individuals are motivated to reach the conclusion that they are not at risk, if the arguments in the message are persuasive they will be forced to accept they are susceptible to the health risk (cf. de Hoog et al., 2005, 2007, 2008). Similarly in considering the recommended response individuals engage in defensively biased information processing (cf. Das et al.; de Hoog et al., 2005, 2007, 2008). However, in processing the recommended response individuals are motivated to reach the conclusion that the response is effective in reducing the health risk. They therefore engage in a biased search for evidence in favour of the response's effectiveness. If this process is effective it should result in an increase in perceived response-efficacy. Therefore, within the EIM, defensively biased information processing serves two functions: it reduces individuals' perceptions of personal threat as a result of generating thoughts minimising that threat; and increases individuals' perceptions of the effectiveness of responses which may alleviate the threat through the generation of positive thoughts about the recommendations (see figure 7.1).

Determinants of Protection Motivation

The EIM maintains the assumption of the EPPM that individuals will either be motivated to protect themselves from the health threat or motivated to defend themselves from the fear associated with the health threat. According to the EIM, individuals will become motivated to protect themselves when perceptions of threat (susceptibility and severity) and efficacy (self- and response efficacy) are both high. This protection motivation should lead to a positive attitude concerning health protective behaviour (i.e., belief that the behaviour will be associated with favourable outcomes). This positive attitude determines individuals' behavioural intentions which in turn determine the adoption of health protective behaviour (cf. Ajzen, 1985, 1987, 1991). However, following the predictions of the TPB, intentions are predicted to also be determined by subjective norms (i.e., both injunctive and descriptive norms; cf. Rivis et al., 2003) and their self-efficacy (cf. Ajzen, 1991). Therefore, self-efficacy is predicted to have both a direct effect on intentions and an indirect effect via its effect on attitudes.

In accordance with the predictions of the integrated model from Studies 2 and 3, the proposed integrated model predicts that self-efficacy will be determined by perceived controllability, past behaviour and health knowledge. Support for these predictions can be found in Studies 2 and 3 where perceived controllability predicted self-efficacy for all health behaviours investigated, past behaviour also consistently predicted self-efficacy. Health knowledge was also associated with self-efficacy but the effects were less consistent across health behaviours. Additionally descriptive norms were added as a predictor of perceptions of self-efficacy. It is proposed that individuals who know others who have adopted healthy diet and exercise behaviours should hold the belief that "if they can do it, so can I" – bolstering their self-efficacy. Further such individuals may have observed others maintaining these healthy habits and obtained some strategies for engaging in these behaviours themselves (cf. Bandura, 1977a, 1982, 1998). This prediction is consistent with the findings of Study 3 and other previous research which has reported positive associations between descriptive norms and self-efficacy (e.g., Hagger & Chatzisarantis, 2005; Rhodes et al., 2008). Finally, to the extent that perceived controllability and self-efficacy represent actual control over the performance of the health protective behaviour, self-efficacy will predict behaviour directly (cf. Ajzen, 1991).

Determinants of Defensive Motivation

Similar to the EPPM the EIM posits that individuals will become defensive when they perceive themselves to be susceptible to a severe health threat but believe that they cannot take effective action to alleviate that health threat. If this occurs the individual will experience high levels of fear which are not offset by the suggestion of the recommended response. This may in turn lead to increased production of minimising thoughts as a means of reducing their fear. These minimising thoughts should give rise to maladaptive fear control responses such as denial/minimisation of risk, defensive avoidance, message derogation or reactance in order to reduce their fear (cf. de Hoog et al., 2007; Hovland et al., 1953; Janis, 1967; Janis et al., 1953; Witte, 1992a, 1992b). de Hoog et al., (2007) suggests that minimising thoughts and fear control responses are similar constructs. Conversely, individuals' positive thoughts about the recommendation should be negatively associated with such maladaptive responding. Maladaptive responses will interfere with the development of adaptive attitudes, intentions and behaviours, such that adaptive and maladaptive responding will be negatively correlated.

Overview of the Research Methodology

In order to test the predictions of the EIM a three phase longitudinal experiment was devised. Participants who completed Study 3 were given the option to continue their participation into a second and third part of that research. The first part of this research (i.e., Study 3) acted as a baseline for comparison to investigate whether any changes occurred over time. In the second part of the research (intervention phase) individuals were presented with a health message. The intervention phase was completed by participants one week following the completion of the baseline phase. The third part of the research (follow-up) was completed approximately one month following completion of the intervention phase. Therefore, Study 4 employed a three part longitudinal design and was conducted over the course of approximately five weeks. The research was designed to test an extended version of the integrated model proposed for this study – or the Extended Integrated Model (EIM).

During the baseline phase individuals completed measures of perceived susceptibility, severity, self- and response-efficacy, health knowledge, attitudes, intentions and diet and exercise behaviours. Individuals' baseline threat (susceptibility and severity) and self-efficacy scores were utilised to develop four psychographic groups: responsive (high threat high efficacy), proactive (low threat high efficacy), avoidant (high threat low efficacy) and indifferent (low threat low efficacy; cf. Rimal 2001; Rimal et al., 2003). In the intervention phase individuals read one of three threat messages (low, moderate or high threat) and one of two efficacy messages (low or high efficacy) relating to obesity diet and exercise. They then completed several measures of their response to the message including measures of: fear, defensive message responses, perceived manipulation, message derogation and defensive avoidance. Following these measures they completed measures of injunctive norms, descriptive norms and perceived controllability in addition to identical measures of susceptibility, severity, self- and response-efficacy, health knowledge, attitudes and intentions to those completed in the baseline phase. This allowed for investigation of whether there were any changes in these outcomes following presentation of the health message, and whether message components or psychographic characteristics moderated these changes. In the follow-up phase participants completed measures of their diet and exercise behaviours since completing the intervention phase (i.e., in the past month). Comparing this with identical measures completed in the baseline phase (see Chapter 6) allowed researchers to investigate whether participants' diet and exercise behaviours had changed over time. This allowed for investigation of the determinants of behaviour within the context of the EIM.

Addressing Limitations of Studies 1, 2 and 3

The research design employed in the present study addressed several limitations of Studies 1, 2 and 3. A limitation of the Studies 1, 2 and 3 is that they each employed cross sectional designs. When research does not employ a pre-post design, any significant relationships between the explanatory variables and health behaviour may be spurious - masking the effect of past behaviour on future behaviour (and the effect of past perceptions of threat/efficacy etc. on future perceptions; Weinstein, 2007). For this reason it has been suggested that cross-sectional or retrospective designs will tend to overestimate the accuracy of the models tested. Controlling for past behaviour, intentions and perceptions (of susceptibility, severity etc.) is one method of minimising this problem (cf. Weinstein, 2007). The three part experimental/longitudinal design employed in Study 4 allows for investigation of changes over time and the effect of past behaviour, intentions and perceptions can be controlled.

In Study 1, participants were presented with a threat message which took the form of a personal account of the health effects of obesity. By contrast, the threat message in the present study was not limited to a personal account; but also included graphic images and a general health message detailing the health consequences associated with obesity and who is susceptible. This serves to make the threat manipulation more similar to fear appeal messages and health promotion materials which may be encountered in the media. It also makes the methodology applied consistent with the extant fear appeal research (cf. Cho, 2003, Cho et al., 2006; Witte, 1992b; 1994; Witte et al., 1998; Witte & Morrison, 2000). In addition to a threat message participants were also presented with an efficacy message which focused on the effectiveness of diet and exercise for reducing weight and the risk of weight-related health problems.

The information contained in the threat and efficacy messages in the present study must be retained by participants in order to respond to the health knowledge questionnaire. This constitutes an improvement over the methodology utilised in Study 1. Recall that in Study 1, individuals were presented with a personal testimonial followed by a set of discrete health facts related to obesity diet and exercise. Participants were then tested for their knowledge of this health information later in the experiment. The methodology employed in Study 4 is an improvement for three reasons. Firstly, participants' health knowledge is tested before and after the presentation of the health information. This allows for investigation of improvements in health knowledge over time and which factors moderate these improvements. This was not possible with the methodology employed in Study 1 meaning that it was unclear whether health information retention or prior health knowledge was being measured. Secondly, the information is presented in a more natural, educational essay style. Individuals are much more likely to encounter health information presented in this manner rather than a set of discrete unrelated health facts. Therefore, the manipulation was more ecologically valid. Finally the threatening content and the health information were presented concurrently. As such, the threat manipulation could affect information processing directly. In contrast, in Study 1 the health information and the threat manipulation were separated in time. As such, only a residual impact of the manipulation on information processing was investigated. As a result, perceptions of fear and threat as a result of the threat manipulation may have been less vivid when processing the health information. This methodological flaw may have accounted for the null results found in Study 1.

The present study also addressed limitations of Studies 2 and 3. Behaviour is measured as an outcome variable in the follow-up phase of the study. Therefore, the strength of the intention-behaviour link can be investigated. This is an improvement over Studies 2 and 3 which relied on intentions as a proxy measure of behaviour. Measures of other outcomes such as defensive avoidance, minimisation, message derogation and perceived manipulation were also included in Study 4 to allow for further exploration of why certain individuals do not engage in health protective responses. Therefore, the EIM investigated in the present study constitutes a more comprehensive model which is able to explain a wider range of outcomes and responses than the integrated model investigated in Studies 2 and 3. As such, the present study addresses several of the major limitations of Studies 1, 2 and 3.

Summary of Research Aims, Hypotheses and Predictions of the EIM

Study 4 aims to test the predictions of the EIM detailed above. The EIM makes several predictions concerning how health message components and psychographic characteristics may determine various outcomes (i.e., threat and efficacy perceptions, attitudes, intentions, defensive message processing, reactance, defensive avoidance); it also makes several predictions about relationships between constructs from the EPPM, TPB and Stage Model. Therefore, the present study aims to investigate how health message and psychographic characteristics moderate responses to a threatening health message. It further aims to explore relationships between constructs from the EPPM, TPB and Stage Model within the EIM framework (see figure 7.1). The EIM makes several novel predictions concerning relationships between these constructs. These are either justified by empirical research (including research presented in this thesis) or reasonable inferences concerning how these constructs may be related. The EIM implies a hierarchical structure whereby the proximal determinants of intentions and behaviour (e.g., attitudes, intentions and self-efficacy) are themselves determined by more distal determinants (e.g., response-efficacy, past behaviour and perceived controllability). Therefore, the current study does not aim to simply uncover the determinants of intentions and behaviour but also other outcomes including: positive attitudes concerning health protective behaviour; perceptions of self-efficacy; defensive message processing and maladaptive responses. Taken together Study 4 aims to investigate the predictions of the EIM (detailed in the above sections) concerning: how the content of a health message and individuals psychographic characteristics determine their response to the health message; and how predictors from the TPB, EPPM and Stage Model are related and how they combine to determine health behaviour and intentions.

Method

Participants

Baseline phase.

Participants who completed Study 3 were given the option to continue their participation into two further phases of the research (see Chapter 6 for more detailed information regarding this sample). Five hundred and forty-five participants were recruited into the study. Forty-five participants were removed from data analysis due to incomplete data leaving exactly 500 participants who completed the baseline phase of the study (91.74%; see figure 7.2).

Intervention phase.

The intervention phase was completed by participants approximately one week following their participation in the baseline phase of this research. Significant attrition occurred between the baseline and intervention phases of the research with only 228 participants continuing their participation into the intervention phase (45.60%; 80.7% female). Of those 228, sixteen participants (7.02%) were removed from analysis due to incomplete data.

Follow-up phase.

The follow-up was completed approximately one month following participation in the intervention phase. Again significant attrition was recorded. Seventy-seven participants continued their participation into the follow-up phase (36.21%; 87.00% female). A further 16 participants were removed due to incomplete data leaving a final sample of 61 participants.

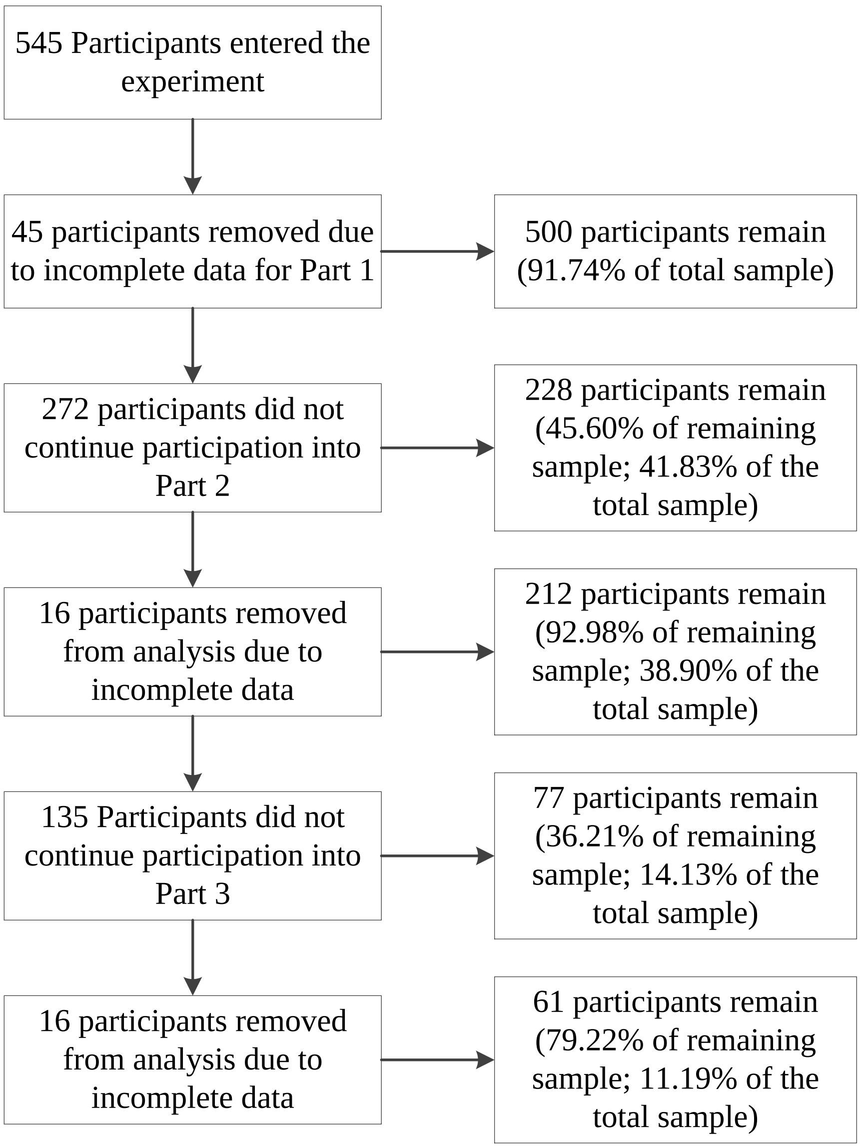

Figure 7.2. Flowchart depicting participant attrition between Parts 1 (baseline), 2 (intervention) and 3 (follow-up) of the study.

Threat and Efficacy Messages

During the intervention phase, participants were randomly assigned to view one of three threat messages (low, moderate and high threat) and one of two efficacy messages (low or high efficacy). These health messages were written by the researchers and based on similar messages designed by Witte (e.g., 1992b, 1994; personal communication with author 2011; Stevenson & Witte, 1998; see also Cho, 2003). However, they were applied to an obesity, diet and exercise context. Similar messages have been used extensively in previous fear appeal research (Carcioppolo et al., 2013; Cho; Cho et al., 2006; Ruiter et al., 2003; Stevenson et al.; Witte, 1992b, 1994; Witte & Morrison, 2000). The images and textual descriptions were progressively more threatening (from low to high threat; see table 7.1). That is, the low threat message was designed to be non-threatening, presenting information in an impersonal and matter-of-fact manner (e.g., “Overweight and obesity can have several adverse health effects”). In contrast, the high threat message was designed to include vivid and personalised descriptions of the health effects of obesity, skin cancer or smoking (e.g., “If you are overweight or obese you are at increased risk for several adverse and potentially life threatening health effects”) and confronting images of some of the more severe health effects of overweight and obesity (e.g., gangrene of the foot, stroke). Additionally participants assigned to the moderate and high threat conditions were presented with a mock case study which further emphasised some of the adverse health effects of obesity.

The high efficacy message focused on the beneficial effects of healthy diet and exercise and the ease with which healthy lifestyle changes can be adopted (e.g., “There are a number of simple but effective lifestyle changes you can make to lose weight”; see table 7.2). In contrast, the low efficacy message focused on the difficulty many people have with changing their diet and exercise, and that results are often slow (e.g., “Often a

Table 7.1

Examples of Important Differences Between Threat and Efficacy Messages

Threat Message	Low Threat	Moderate Threat	High Threat
Imagery Component.	Images of overweight individuals Pictures of unhealthy foods and their calorie content. Campaign images.	Man who has had a heart attack receiving defibrillation. Images of gout affecting the hands and feet. "Are you pouring on the pounds?" campaign image.	Heart bypass surgery "Obesity is suicide" campaign images Gangrenous hands and feet with amputations.
Written component	Neutral language Impersonal Factual No case study	Moderately personalistic and vivid Effects of overweight and obesity in Australia stressed. Case study: middle aged woman	Very personalistic and vivid language Effects of overweight and obesity in Australia stressed Individuals' personal risk stressed Case Study: 32-year-old woman, developed type 2 diabetes at age 24.
Examples of threat manipulation	"[Obesity] has been shown to increase the likelihood of health problems" conditions"	"Obesity has been shown to increase the likelihood of several serious medical conditions"	"[Obesity has] been shown to increase the likelihood of several life threatening medical conditions"

Threat Message	Low Threat	Moderate Threat	High Threat
Susceptibility	No case study	"A 52 year old woman with obesity and a two year history of type 2 diabetes presents with complaints of fatigue…"	"At age 24 she developed type 2 diabetes and became less able to control her eating."
Severity	No case study	"She complains that pain in her knees and ankles make it difficult to exercise"	"Her right foot had to be amputated due to gangrene and she had become blind; both complications of her diabetes"

Efficacy Message	Low Efficacy	High Efficacy
Written Component	Self- and response-efficacy for using diet and exercise for achieving and maintaining weight depicted as being low. Emphasises that losing weight is often slow and laborious Emphasises that crash dieting is ineffective for achieving weight losses in the long term. Lists reasons why people may not adopt an exercise program	Self- and response-efficacy for using diet and exercise for achieving and maintaining weight depicted as being high. Emphasises that there are a number of simple and effective lifestyle changes which can be adopted to achieve weight loss. Emphasises the effectiveness of exercise in achieving weight loss. Discusses how exercise sessions can easily fit into your day.

lot of effort is needed to achieve only a small loss of weight.”). All the information contained in both of these manipulations is factual and taken from various medical textbooks, Australian government websites, and government brochures (e.g., AIHW, 2010; Beers et al., 2010).

All images used in this experiment were freely available in the public domain. Textual descriptions and images such as these have been used successfully to manipulate perceptions of threat and efficacy in several fear appeal experiments (e.g., Cho, 2003; Cho & Salmon, 2006; Das et al., 2003; Keller & Block, 1996; Rippetoe & Rogers, 1987; Witte, 1992a, 1994). Once the threat and efficacy measures were completed a small pilot study (N = 7) was devised to further validate the messages. Participants were asked to rank each of the three threat messages in order of “how fear provoking and threatening” they were. As expected, participants unanimously selected the high threat message as the most fear provoking and threatening, followed in turn by the moderate and low threat messages. The same participants also read both efficacy messages and were asked to rank them in order of how “helpful and effective” the message made diet and exercise seem as a means of managing weight. Participants unanimously selected the high efficacy message as suggesting that diet and exercise were the most helpful and effective. These results suggest that the high threat message was perceived to be the most threatening of the three threat messages and the high efficacy message was perceived to be more strongly suggesting that diet and exercise are effective for managing weight.

Measures

Each of the measures used were adapted from those used in previous research (e.g., Chatzisarantis et al., 2009; Cho, 2003; Das et al., 2003; de Hoog et al., 2005, 2008; Fishbein et al., 2010; Jones et al., 2004; Nejad et al., 2006; Payne et al., 2004; Rivis &

Sheeran, 2003; Witte,1992a, 1994; Witte, n.d.; Witte et al., 1996). The items were phrased similarly to those used in previous research, but were adapted to match the health behaviours investigated in this research. This research explored predictors of six health behaviours: exercising for 30 minutes a day five days a week, maintaining a balanced diet, minimising intake of foods high in saturated fat, minimising intake of foods high in sugar, avoiding intake of fast food, and avoiding the intake of drinks high in sugar. Measures of attitudes, injunctive norms, descriptive norms, perceived controllability, susceptibility, severity, self-efficacy, response-efficacy, intentions and health knowledge were completed in the intervention phase of the research. These measures were identical to those completed in the baseline phase and are fully described in Chapter 6. However, in the intervention phase participants completed additional measures including measures of: fear, defensive message processing, message quality and fear control processes (e.g., defensive avoidance, perceived manipulation and message derogation). During the follow-up, participants completed a measure of their diet and exercise behaviour over the preceding month. Unless otherwise indicated all measures utilised a 7-point Likert scale anchored by “Strongly disagree” and “Strongly agree”. The scores given on the items from each measure were summed and averaged to yield a mean item score between one and seven prior to analysis.

Fear.

Fear arousal elicited by the message was measured in the intervention phase only using a mood adjectives scale. Given the stem “How much did reading this message make you feel…” participants rated on a 7-point likert scale (where 1 = not at all and 7= very much) the extent to which they felt “frightened”, “tense”, “nervous”, “anxious”, “uncomfortable”, “nauseous”, and “disgusted”. Similar items have been used to measure perceived fear in numerous fear appeal experiments (e.g., Cho, 2003; Cho et al., 2006; Witte, 1992a, 1994) and scales such as this have been found to positively correlate with physiological arousal (Rogers & Mewborn, 1976). The scale was found to have excellent internal consistency (α = .93).

Defensive message processing.

Participants' defensive message processing of the fear appeal messages was measured in the intervention phase only using a thought listing task. Participants were asked to list any thoughts they had concerning the recommendations in the fear appeal message that they read. This method of measuring defensive message processing has been used in previous research both related to fear appeals (e.g., Das et al., 2003; de Hoog et al., 2005, 2008) and unrelated (e.g., Chaiken, 1980). Each of the participants' thoughts were coded by two independent raters as either generally for the fear appeal message (positive thoughts; e.g., "I found it interesting to see the consequences of a bad diet" [sic]), generally against the fear appeal message (negative thoughts; "most people are too busy or unable to afford the things needed to live a healthy life" [sic]) or irrelevant ("I already knew most of that stuff" [sic]). The inter-rater reliability was excellent for positive thoughts (κ = .93; M = 1.50; range: 0-6), negative thoughts (κ = .87, M = .59; range: 0-6), irrelevant thoughts (κ = .95; M = .38; range: 0-3) and total thoughts (κ = .96; M = 2.47; range: 0-8). Positive thoughts were further sub-categorised as positive thoughts specifically about the message recommendations (e.g., "exercise and eating well are healthy to one's well being" [sic]; M = .61, range = 0-3). Negative thoughts were further sub-categorised as minimising thoughts about the health threat (e.g., "they've discovered that being a few kilos overweight has a protective benefit for people over 40" [sic]; M = .31, range = 0-6). The number of positive thoughts about the recommendation, and minimising thoughts were used as measures of defensive processing.

Message quality.

The message quality measure was administered in the intervention phase only. It contained seven items measuring participants' perceptions of the quality of the arguments contained in the manipulations (e.g., "This message was an accurate description of obesity and weight-related illnesses."). The measure was found to have good internal consistency (α = .81).

Maladaptive responses.

Following previous EPPM research, maladaptive (i.e., fear control; cf. Witte, 1992a) responses were measured using scales of defensive avoidance, perceived manipulation and message derogation (e.g., Cho, 2003; Cho et al., 2006; Ruiter et al., 2003; Witte, n.d.; Witte, 1992a, 1994). Fear control items were presented in the intervention phase only.

Defensive Avoidance. The defensive avoidance scale contained four items measuring participants' tendency to avoid cognitions concerning the content of the fear appeal message **(**two items; e.g., "When I was reading the message and looking at the pictures, my instinct was to…" ["want to think about weight-related illnesses"/"not want to think about weight-related illnesses"]) and avoid acting on the content of the message (two items; e.g., "When I was reading the message and looking at the pictures, my first instinct was to…" ["want to protect myself from weight-related illnesses"/"not want to protect myself from weight-related illnesses"]). Each of the items was measured using a seven-point semantic differential scale. The scale was found to have acceptable internal consistency (α = .79).

Perceived Manipulation. The four-item perceived manipulation scale measured the extent to which participants believed the fear appeal message was attempting to manipulate them. Participants indicated whether they believed the health message "was manipulative”, “was misleading”, “was exploitative” and “tried to manipulate me”. The internal consistency for the measure was acceptable (α = .76).

Message Derogation. To measure message derogation participants were asked to what extent they believed the fear appeal message to be “exaggerated”, “distorted”, “overblown” and “overstated” (α = .95).

Behaviour.

During the follow-up research participants completed measures of how often they consumed foods high in fat, ate fast food, foods high in sugar and drank soft drinks high in sugar. Participants also completed measures of how many exercise sessions they engaged in during the past month and how long these exercise sessions were. These items were identical to those used in the baseline phase (see Chapter 6).

Procedure

Undergraduate participants accessed the study from an advertisement placed on a research participation website run by the university (SONA). General public participants were informed about the study via advertisements placed in public places and online advertisements placed on Facebook. Participants were informed that the research was investigating how the media impacts on health behaviours.

Participants accessed the baseline phase (i.e., Study 3) online via a study website placed on the university server. Participants firstly completed the demographics and past behaviour questionnaire, they were then presented with measures of susceptibility, severity, self-efficacy, response-efficacy, attitudes, injunctive norms, descriptive norms and perceived controllability followed by measures of intentions and health knowledge (see also Chapter 6). Following the completion of the baseline phase, participants were asked to indicate whether they would like to continue their participation. Those who indicated their intention to continue were given a unique code which was used to identify them for the later phases.

Participants were sent a reminder email five to seven days following their participation in the baseline phase reminding them to participate in the next phase of the study and providing the relevant links and their unique code. Those who had not participated within nine days were sent a second reminder email. No further contact was given to participants who still failed to participate. Participants who accessed the intervention phase of the study were instructed to read one of three threat messages (low, moderate, high) and one of two efficacy messages (low, high). Participants then completed measures of fear, defensive message processing, message quality, defensive avoidance, perceived manipulation and message derogation in that order. Next participants completed identical versions of each of the measures from baseline phase. Following the completion of intervention phase, participants were asked to indicate whether they would like to continue their participation.

Participants who indicated they would like to continue their participation were sent an email reminding to complete next phase of the study 28-30 days following their participation in the intervention phase. During the final follow-up phase, participants completed a measure of behaviour change. Following completion of the study participants were fully debriefed and the true nature of the study.

Results

Principle Components Analysis on Measures of Maladaptive Responses

A principal components analysis (with Varimax rotation) was performed to investigate whether the three maladaptive (or fear control; cf. Witte, 1992a) responses variables (i.e., defensive avoidance, perceived manipulation and message derogation) actually represent three distinct constructs. A three factor solution which explained 73.26% of the variance was found. The four perceived manipulation and the four message derogation items each loaded on factor 1 which explained 42.42% of the variance (eigenvalue = 5.09). This suggests that message derogation and perceived manipulation are likely measuring the same underlying construct. This construct may be described as *reactance* as both message derogation and perceived manipulation measured participants negative reactions to a threatening message designed to persuade them to change their behaviour (cf. Brehm, 1966; Brehm et al., 1981). Two of the four defensive avoidance items loaded on the factor 2 (eigenvalue = 1.86; additional variance explained = 15.46%). Both these items were related to avoiding thinking about the content of the fear appeal message. The remaining two defensive avoidance items loaded on factor 3. These items were related to avoiding acting on the content of the fear appeal message. Factor 3 explained a further 15.38% of the variance (eigenvalue =1.85). This suggests that the defensive avoidance measure actually represented two distinct constructs: *cognitive avoidance* and *behavioural avoidance.* As a result of the principle components analysis the fear control variables were recast as reactance (α = .91), cognitive avoidance (α = .82) and behavioural avoidance (α = .88).

Cluster Analysis to Validate Psychographic Groups

The RPA predicts that individual's health behaviours and their responsiveness to health messages will be determined by their psychographic characteristics – specifically their perceptions of threat and efficacy. Following the procedures employed in RPA research participants were separated into four psychographic groups on the basis of their perceptions of threat (susceptibility and severity) concerning weight-related illnesses and their self-efficacy with respect to adopting each particular diet and exercise behaviour (e.g., Rimal, 2001; Rimal et al., 2003; Rimal, Brown et al., 2009; Turner et al., 2006). The baseline data were utilised to generate the psychographic groups. Recall that the four groups outlined in the RPA are responsive (high threat, high self-efficacy), proactive (low threat, high self-efficacy), avoidant (high threat, low self-efficacy) and indifferent (low threat, low self-efficacy).

Prior to analysis a single self-efficacy measure was calculated combining and averaging each of the self-efficacy items for each health behaviour into a single scale. The resultant 24-item measure was found to have excellent internal consistency (α = .94). A four group K-means cluster analysis as performed using a six-item perceived threat measure (three susceptibility plus three severity items, $\alpha = .80$) and the 24-item self-efficacy measure as clustering variables (cf. Rimal, Brown et al., 2009). Both threat ($F(3,496) > 314.15$, $p < .001$) and self-efficacy ($F(3,496) > 371.14$, all $p < .001$) were utilised in the formation of the clusters. Table 7.2 shows the differences in perceived threat, and self-efficacy between clusters for each of the health behaviours investigated.

The largest proportion of participants belonged to the proactive cluster (n = 168), followed in turn by the indifferent ($n = 163$), responsive ($n = 86$) and avoidant clusters ($n = 83$). As expected, the responsive and avoidant clusters reported greater perceived threat relative to those in the proactive and indifferent clusters. Further, the responsive and proactive clusters reported higher self-efficacy when compared with the avoidant and indifferent clusters. However, the indifferent group reported higher self-efficacy than the avoidant group for one of the six health behaviours (avoid fast food high in sugar). Nevertheless these findings suggest that the pattern of threat and self-efficacy perceptions among the clusters closely map onto the groups defined by the RPA.

Table 7.2

Perceived Threat and Self-efficacy for each of the four RPA Groups Formed using Cluster Analysis with Accompanying ANOVA Results

	Responsive			Proactive			Avoidant			Indifferent			
Variable	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*F*(3, 496)
Threat	86	5.34_a	.77	168	3.26_b	.75	83	5.56_a	.72	163	3.38_b	.71	314.15****
Self-Efficacy													
Exercise 30 mins		5.22_a	1.45		5.56_a	1.39		3.52_b	1.25		3.89_b	1.44	62.69****
Healthy diet		5.83_a	.85		6.09_a	.75		4.01_b	1.06		4.30_b	1.00	168.04****
Avoid fat		5.74_a	.87		6.01_a	.85		3.86_b	.99		4.12_b	.97	176.98****
Fast food		6.24_a	.67		6.42_a	.64		4.48_c	1.06		4.88_b	1.15	135.95****
Soft drink		6.21_a	.77		6.43_a	.68		4.87_b	1.26		4.99_b	1.16	96.00****
Avoid Sugar		5.73_a	.87		5.97_a	.88		4.08_b	.90		4.37_b	.97	134.12****

Note: means which do not share the same subscript are different at $p < .05$ (Tukey's HSD, i.e., $_a$ is different to $_b$), threat and self-efficacy scores range from 1-7. **** = $p < .001$.

Other Psychographic Characteristics of Responsive, Proactive, Avoidant and Indifferent Individuals

Drawing on the predictions of the RPA, the EIM forwarded several predictions concerning other psychographic characteristics of individuals given their perceptions of susceptibility and self-efficacy. It was predicted that responsive and proactive individuals will be more likely to have positive attitudes, health protective intentions and health knowledge when compared with the avoidant and indifferent groups. A series of one-way between subjects ANOVA were utilised to test each of these predictions; a summary of these results is presented in table 7.3.

Effect of psychographic groups on intentions.

Analyses of variance revealed a consistent pattern of results across all six health behaviours for intentions. The responsive and proactive groups consistently reported significantly greater health protective intentions than the avoidant and indifferent groups (see table 7.3).

Effect of psychographic groups on attitudes.

The responsive and proactive groups were found to have significantly more positive attitudes when compared with the indifferent group for all the health behaviours investigated (see table 7.3). Further, the avoidant group also recorded significantly less positive attitudes concerning adopting a healthy diet and avoiding foods high in fat than the responsive and proactive groups. However, contrary to predictions the avoidant groups' attitudes did not differ from the other psychographic groups for the remaining four health behaviours.

Effect of psychographic groups on health knowledge.

The responsive group was found to have significantly greater threat health knowledge than both the avoidant and indifferent groups (see table 7.3). However, the proactive

Table 7.3

Mean Intentions, Attitudes, Threat and Efficacy Health Knowledge, Past Behaviour and BMI as a Function of Health Behaviour and RPA Group with Accompanying ANOVA Results

	Responsive		Proactive		Avoidant		Indifferent		
Health Behaviour	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*(3, 496)
Intentions									
Exercise 30 mins	5.23_a	1.93	5.10_a	1.78	4.06_b	1.77	3.97_b	1.77	16.88****
Healthy diet	5.94_a	1.22	5.69_a	1.32	4.67_b	1.41	4.66_b	1.41	28.71****
Avoid fat	6.09_a	1.04	5.74_a	1.25	4.69_b	1.38	4.55_b	1.37	42.08****
Fast food	6.34_a	1.05	6.17_a	1.15	5.17_b	1.43	5.09_b	1.48	31.05****
Soft drink	6.19_a	1.30	6.12_a	1.27	5.20_b	1.59	4.92_b	1.70	24.68****
Avoid sugar	6.15_a	.95	5.77_a	1.17	4.84_b	1.34	4.71_b	1.38	37.15****
Attitudes									
Exercise 30 mins	6.45_a	.81	5.50_a	.86	6.22_{ab}	1.21	5.92_b	1.22	9.93****
Healthy diet	6.76_a	.58	6.63_a	.78	6.30_b	1.13	6.28_b	1.06	7.88****
Avoid fat	6.65_a	.68	6.58_a	.81	6.13_b	1.25	5.98_b	1.21	13.61****
Fast food	6.70_a	.68	6.63_a	.81	6.43_{ab}	.96	6.22_b	1.10	7.56****
Soft drink	6.60_a	.86	6.60_a	.83	6.33_{ab}	1.06	5.98_b	1.17	12.59****
Avoid sugar	6.71_a	.59	6.57_{ab}	.81	6.30_b	1.03	6.09_{bc}	1.11	11.51****

	Responsive		Proactive		Avoidant		Indifferent		
Health Behaviour	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	$F(3, 496)$
Threat HK	3.33_{a}	1.47	2.88_{ab}	.69	2.45_{b}	1.70	2.32_{bc}	1.66	4.59***
Efficacy HK	10.32_{a}	3.52	9.63_{ab}	6.84	8.98_{ab}	3.98	8.58_{b}	3.87	8.27****
Exercise PW_1	2.95_{ab}	2.37	3.25_{a}	2.49	1.87_{c}	2.10	2.23_{b}	2.13	9.83****
High fat food intake	3.10_{a}	2.47	3.01_{a}	2.53	5.52_{b}	6.30	4.47_{b}	3.26	11.51****
Fast food intake	$.80_{a}$	.96	$.66_{a}$	.86	1.53_{b}	1.18	1.47_{b}	1.33	21.12****
Soft drink intake	1.45_{a}	2.22	1.35_{a}	2.71	3.67_{b}	4.25	3.06_{b}	3.68	14.45****
High sugar food intake	2.85_{a}	3.02	2.88_{a}	2.66	4.84_{b}	8.34	4.53_{b}	3.39	6.90****
BMI	26.84_{a}	6.21	22.82_{b}	3.58	28.51_{a}	7.61	23.67_{b}	5.29	27.37****

Note: HK = health knowledge, $_1$ = self-reported hours of exercise per week over the past month, $_2$ = number of times food is eaten per week over the past month. Means which do not share the same subscript are different at $p < .05$ (Tukey's post-hoc tests; i.e., $_a$ is different to $_b$, $_{ab}$ is not different to $_a$ or $_b$, but is different to $_c$), intentions and attitudes scores range from 1-7. Threat health knowledge scores range from 0-5, efficacy health knowledge scores range from 0-17, * = $p < .05$ ** = $p < .01$. *** = $p < .005$. **** = $p < .001$.

group had greater threat health knowledge than the indifferent group only. No other significant differences in threat health knowledge were recorded between psychographic groups. The responsive group was also found to have significantly greater efficacy health knowledge than the indifferent group only. No other differences were found between psychographic groups.

Rates of past exercise behaviour between psychographic groups.

It was predicted that proactive individuals will have engaged in the most exercise followed in turn by the responsive, avoidant and indifferent groups. Analysis of variance was utilised to test this prediction. The proactive group reported significantly greater duration of weekly exercise when compared with both the avoidant and indifferent groups. However, the responsive group reported greater past exercise than the avoidant group only (see table 7.3).

Rates of past unhealthy eating habits between psychographic groups.

It was predicted that proactive and responsive individuals will have the lowest rates of unhealthy eating habits over the past month. Analyses of variance were utilised to test this prediction for each of the dietary behaviours investigated (see table 7.3). The same pattern of findings was found for past intake of: foods high in fat, fast food, soft drink and foods high in sugar. Those in the avoidant and indifferent groups reported consuming significantly greater quantities of these unhealthy foods when compared with the responsive and proactive groups.

Body mass index between psychographic groups.

Body mass index was also investigated as a potential difference between psychographic groups. One-way between subjects ANOVA was utilised. Those in the responsive and avoidant groups reported significantly higher BMIs than those in the proactive and indifferent groups. Those in the responsive and avoidant group recorded BMIs which fall in the overweight range of the scale (i.e., BMI between 25-30) whereas those in the proactive and indifferent groups recorded BMIs in the normal range (BMI between 18.5 and 25; see table 7.3).

Confound Checks

A series of 3 (threat message: low, moderate, high)*2 (efficacy message: low, high) ANOVAs were utilised in order to check that there were no systematic differences in the outcome or predictor variables between threat and efficacy message groups at baseline. As expected, no significant differences in baseline susceptibility, severity, self-efficacy, response-efficacy, attitudes, intentions, BMI and health knowledge between threat or efficacy message groups (all *F*s < 3.49, n.s.). However, a main effect of threat was found for message quality ($F(2,206) = 3.98$, $p < .05$, $\eta_p^2 = .04$). Tukey's post hoc tests revealed that the high threat message ($M = 5.90$, $SD = .91$) was believed to be of higher quality than the low threat message ($M = 5.55$, $SD = .79$). No other significant differences were found.

As there was significant attrition between the baseline and intervention phases of this research it was also necessary to identify any differences between those who continued their participation and those who dropped out following the baseline phase of the study. A series of independent samples t-tests were utilised to investigate whether there were any differences in the predictor or outcome variables at baseline between those who completed intervention phase and those who did not. In almost all cases no significant differences were observed (all *t*s(497) < 1.94, all *p*s > .05). However, those who completed the intervention phase reported significantly higher response-efficacy regarding the effectiveness of avoiding fast food ($t(497) = -2.24$, $p < .05$) and avoiding foods high in sugar ($t(497) = -2.53$, $p < .05$) than those who did not. Further those who completed the intervention phase had significantly greater threat ($t(497) = -2.48$, $p <$

.05) and efficacy health knowledge (t(497) = -4.30, $p < .001$) when compared with those who did not. This suggests that on the whole those who completed the intervention phase were in most respects very similar to those who did not. However, they did possess greater baseline health knowledge and tended to believe that avoiding fast food and foods high in sugar is more effective for losing weight when compared with those who did not complete this phase of the study.

Effect of the Health Message and Psychographic Groups on Changes in Threat Perceptions from Baseline

The EIM predicted that those who are presented with a high threat message will show a greater increase in susceptibility and severity when compared with those exposed to a low threat message. It was also predicted that only indifferent individuals' perceptions of threat would increase following the presentation of a high threat message. Perceptions of threat should remain unchanged regardless of the intensity of the threat message for the responsive, indifferent and avoidant individuals. Three-way (4 [psychographic group: responsive, proactive, avoidant, indifferent]*3 [Threat message: low, moderate, high]*2 [time: baseline phase, intervention phase]) mixed ANOVAs were utilised to investigate these predictions. The within subjects factor was time, individuals responses at baseline were compared to their responses during the intervention phase in order to investigate whether any changes in perceived susceptibility and severity had occurred following the presentation of the health message. Separate analyses were conducted for susceptibility and severity. Power to detect a medium effect size ($f = .25$, $\eta_p^2 = .06$) exceeded .80 for both analyses; power to detect a large effect size ($f = .40$, $\eta_p^2 = .16$) exceeded .99.

Susceptibility.

Three-way mixed ANOVA revealed no main effect of time ($F(1,201) = .88$, $p = .35$, $\eta_p^2 = .004$), indicating that on the whole no changes in susceptibility were recorded from baseline (time 1). However, a significant time * psychographic group interaction effect was found ($F(3,201) = 9.17$, $p < .001$, $\eta_p^2 = .12$). Perceptions of susceptibility were found to be greater during the intervention phase ($M = 2.55$, $SD = 1.36$) when compared with baseline ($M = 1.90$, $SD = .99$) for the indifferent group only (see figure 7.3). All other differences between psychographic groups were non-significant. Contrary to predictions the threat ($F(2,201) = .82$, $p = .44$, $\eta_p^2 = .01$) message was not found to interact with time. Further, the three-way interaction was also non-significant ($F(6,201) = .32$, $p = .92$, $\eta_p^2 = .01$).

Severity.

Three-way mixed ANOVA revealed no main effect of time on perceived severity ($F(1,201) = 2.41$, $p = .12$, $\eta_p^2 = .01$). However, a significant time * psychographic group interaction effect was found ($F(3,201) = 4.98$, $p < .005$, $\eta_p^2 = .07$). Perceptions of severity were found to be greater during the intervention phase when compared with baseline for both the proactive and indifferent groups (see figure 7.4). All other differences between psychographic groups were non-significant. Contrary to predictions the threat ($F(2,201) = .24$, $p = .79$, $\eta_p^2 = .002$) message was not found to interact with time. Further, the three-way interaction was also non-significant ($F(6,201) = .98$, $p = .44$, $\eta_p^2 = .03$).

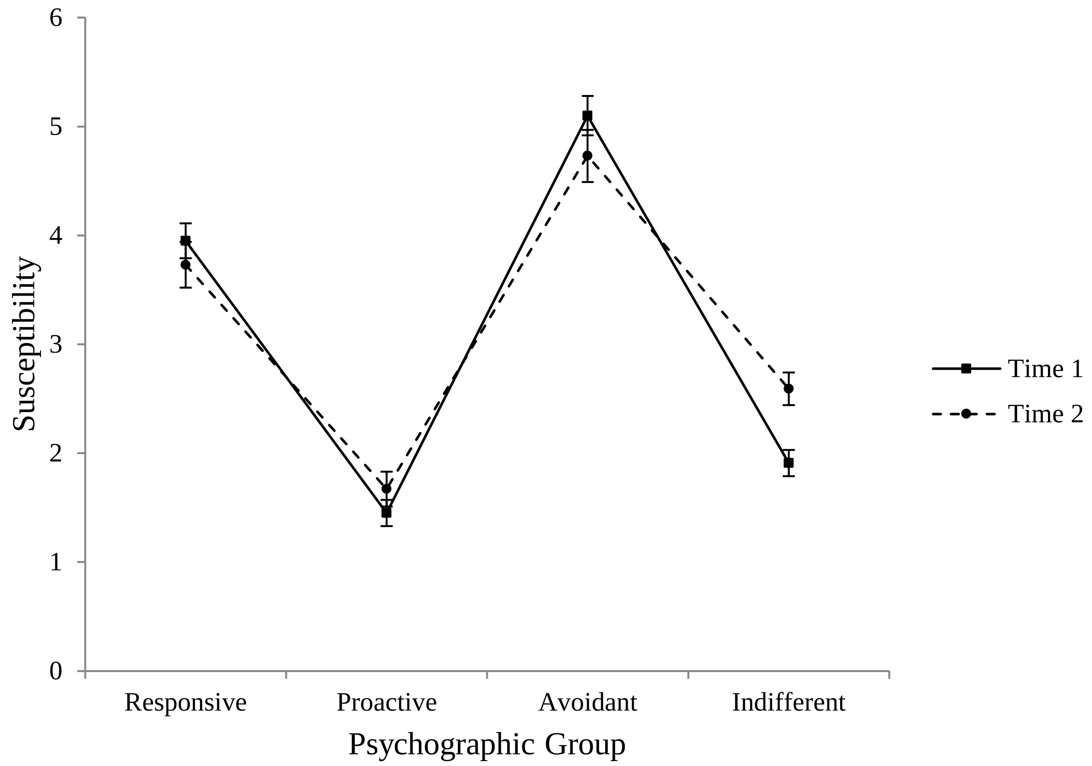

Figure 7.3. Susceptibility as a function of time and psychographic group.

Effect of the Health Message and Psychographic Groups on Changes in Efficacy Perceptions from Baseline

It was predicted that those exposed to a high efficacy message would report higher perceptions of self- and response-efficacy when compared with those viewing a low efficacy message. Further, it was hypothesised that the proactive group's perceptions of efficacy would remain unchanged from baseline regardless of the intensity of the efficacy message; responsive individuals' perceptions of efficacy will be reduced following a low efficacy message; and avoidant and indifferent individuals' perceptions of efficacy will be increased following the presentation of a high efficacy message. Three-way (4 [psychographic group: responsive, proactive, avoidant, indifferent]*2 [Efficacy message: low, high]*2 [time: baseline phase, intervention phase]) mixed ANOVAs were utilised to investigate these predictions. Individuals' responses at baseline were compared to their responses during the intervention phase in order to investigate whether any changes in perceived self- and response-efficacy had occurred following the presentation of the health message. As separate measures of self- and response-efficacy were devised for each of the health behaviours investigated, separate analyses were conducted for each of these health behaviours. Separate sets of analyses were conducted for self- and response-efficacy. Power to detect a medium effect size (f = .25, η_p^2 = .06) exceeded .80 for both analyses; power to detect a large effect size (f = .40, η_p^2 = .16) exceeded .99.

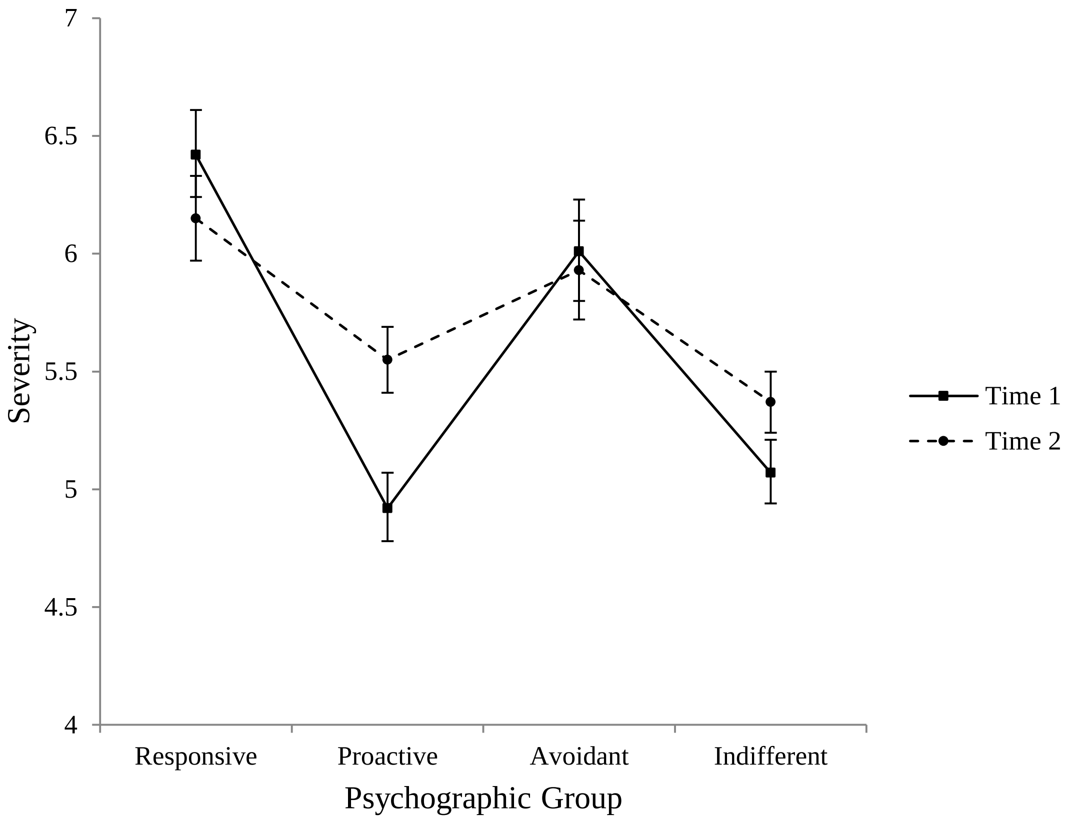

Figure 7.4 Severity as a function of time and psychographic group.

Self-efficacy.

Exercise 30 mins. A significant main effect of time was found (F(1,201) = 7.91, p < 01, η_p^2 = .04). Participants' perceived self-efficacy regarding exercising for 30 minutes per day five days per week was greater at time 1 (M = 4.56, SD = 1.67) when compared with time 2 (M = 4.31, SD = 1.01). However, this effect must be qualified by two significant interaction effects. Time was found to interact with both psychographic group ($F(3,201) = 9.05$, $p <$ 001, $\eta_p^2 = .13$) and efficacy message ($F(1,201) = 4.77$, $p <$ 05, $\eta_p^2 = .03$). The reduction in perceived self-efficacy was only observed in the responsive and proactive groups. No difference over time was recorded for the avoidant or indifferent groups (see table 7.4). A significant reduction in self-efficacy was also observed for the low-efficacy group but not the high efficacy group (see figure 7.5). All other observed effects were non-significant (all Fs < 3.19, all ps > .39). These findings provide partial support to the predictions of the EIM.

Healthy Diet. No significant main effects or interactions were found (all Fs < 1.40, all ps > .24). This indicates that no changes in self-efficacy concerning maintaining a healthy diet were observed from baseline.

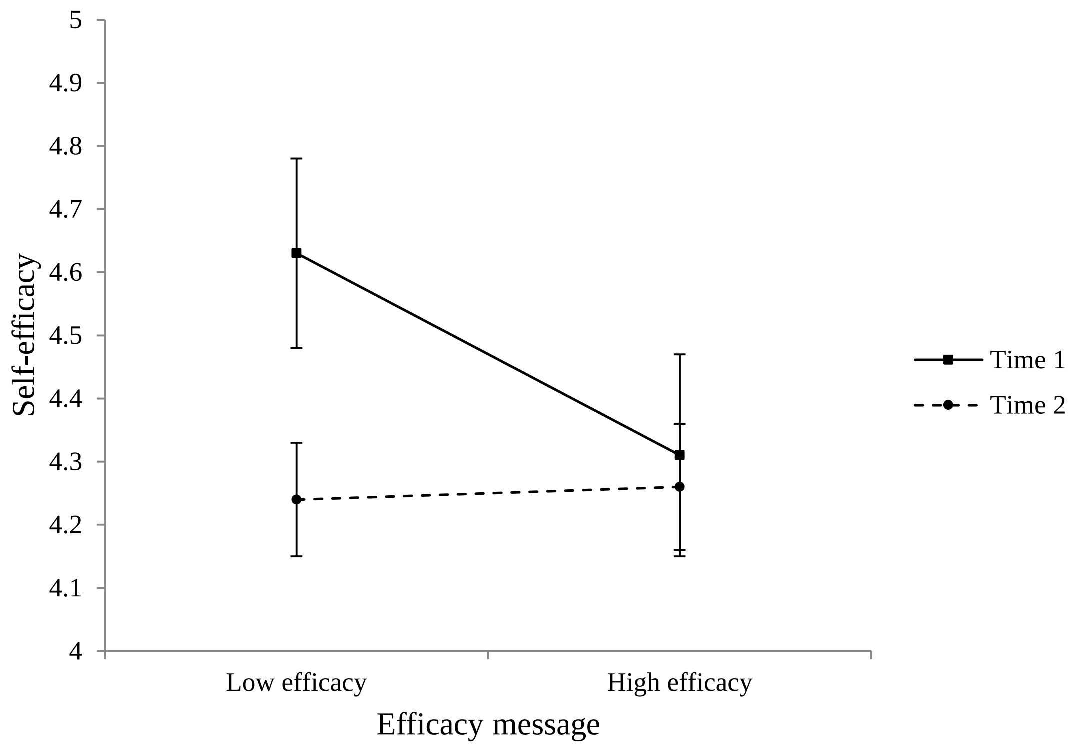

Figure 7.5. Self-efficacy (exercise 30 mins) as a function of time and efficacy message group.

Table 7.4

Self-efficacy Scores as a Function of Time and Psychographic Group with Accompanying ANOVA Results

	Responsive		Proactive		Avoidant		Indifferent	
Health Behaviour	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Exercise 30 mins								
Baseline	5.41_{2}	1.49	5.48_{2}	1.41	3.35_{1}	1.27	3.72_{1}	1.35
Intervention	4.70_{1a}	.90	4.91_{1a}	.83	3.63_{1b}	.87	3.81_{1b}	.83
Healthy diet								
Baseline	5.95_{1}	.84	6.17_{1}	.76	3.92_{1}	1.10	4.46_{1}	1.01
Intervention	5.79_{1a}	.83	5.98_{1a}	.87	4.30_{1b}	1.25	4.38_{1b}	1.00
Avoid fat								
Baseline	5.72_{1}	.92	6.06_{2}	.79	3.86_{1}	1.03	4.30_{1}	.99
Intervention	5.77_{1a}	.85	5.79_{1a}	.99	4.10_{1b}	1.16	4.47_{1b}	.87
Fast food								
Baseline	6.29_{1}	.74	6.47_{2}	.66	4.57_{1}	1.04	4.96_{1}	1.22
Intervention	6.02_{1a}	.78	6.13_{1a}	1.03	4.62_{1b}	1.06	4.86_{1b}	1.12
Soft drink								
Baseline	6.47_{1}	.60	6.53_{2}	.66	4.79_{1}	1.36	5.07_{1}	1.26
Intervention	6.16_{1a}	.80	6.02_{1a}	1.01	5.28_{2b}	1.06	4.80_{1b}	1.14
Avoid sugar								
Baseline	5.83_{1}	.91	5.94_{2}	.95	4.08_{1}	1.08	5.14_{1}	1.24
Intervention	5.74_{1a}	.88	5.63_{1a}	1.19	4.34_{1b}	.82	4.51_{1b}	.89

Note: means between rows which do not share the same subscript (number) are significantly different at $p < .05$ (i.e., $_{1}$ is different to $_{2}$). Means between time 2 columns which do not share the same subscript (letter) are significantly different at $p < .05$ (i.e., $_{a}$ is different to $_{b}$).

Avoid foods high in fat. No significant main effect of time was observed ($F(1,201) = .08$, $p = .77$, $\eta_p^2 < .001$) indicating that participants' self-efficacy was unchanged from baseline. However, a significant time * psychographic group interaction effect was found ($F(3,201) = 3.19$, $p < .05$, $\eta_p^2 = .05$). A significant reduction in self-efficacy was recorded for the proactive group only. All other interaction effects were non-significant (all *F*s < 1.33, all *p*s > .25).

Avoid Fast Food. Three-way mixed ANOVA revealed a significant main effect of time ($F(1,201) = 11.79$, $p < .001$, $\eta_p^2 = .06$). On the whole participants' self-efficacy was reduced at time 2 (M = 5.42, SD = 1.19) relative to time 1 (M = 5.64, SD = 1.23). However, this main effect must be qualified by a significant time * psychographic group interaction ($F(3,201) = 2.67$, $p < .05$, $\eta_p^2 = .04$). The reduction in the self-efficacy was only significant in the proactive group (see table 7.4). However, this two-way interaction must also be qualified by a significant time*psychographic group*efficacy interaction ($F(6,201) = 2.90$, $p < .05$, $\eta_p^2 = .04$). The reduction in self-efficacy within the proactive group was only present in those who viewed the low-efficacy message. Those who viewed the high efficacy message recorded no significant reduction in self-efficacy from baseline (see figure 7.6).

Avoid soft drink. No significant main effect of time was observed ($F(1,201) = 2.29$, $p = .13$, $\eta_p^2 = .01$) indicating that participants' self-efficacy was unchanged from baseline. However, a significant time * psychographic group interaction effect was found ($F(3,201) = 8.64$, $p < .001$, $\eta_p^2 = .05$). A significant reduction in self-efficacy was recorded for the proactive group over time. In contrast, a significant increase in self-efficacy was found for the avoidant group. No significant differences were recorded for the responsive or indifferent groups. All other interaction effects were non-significant (all Fs < 1.25, all ps > .29).

Avoid foods high in sugar. The main effect of time was found to be non-significant ($F(1,201) = .20$, $p = .66$, $\eta_p^2 = .001$). However, the time * psychographic group interaction effect was significant ($F(3,201) = 8.64$, $p < .001$, $\eta_p^2 = .05$). A significant reduction in self-efficacy from baseline was recorded for the proactive group only. No significant differences were recorded for the responsive, avoidant or indifferent groups. All other interaction effects were non-significant (all Fs < 2.43, all ps > .07).

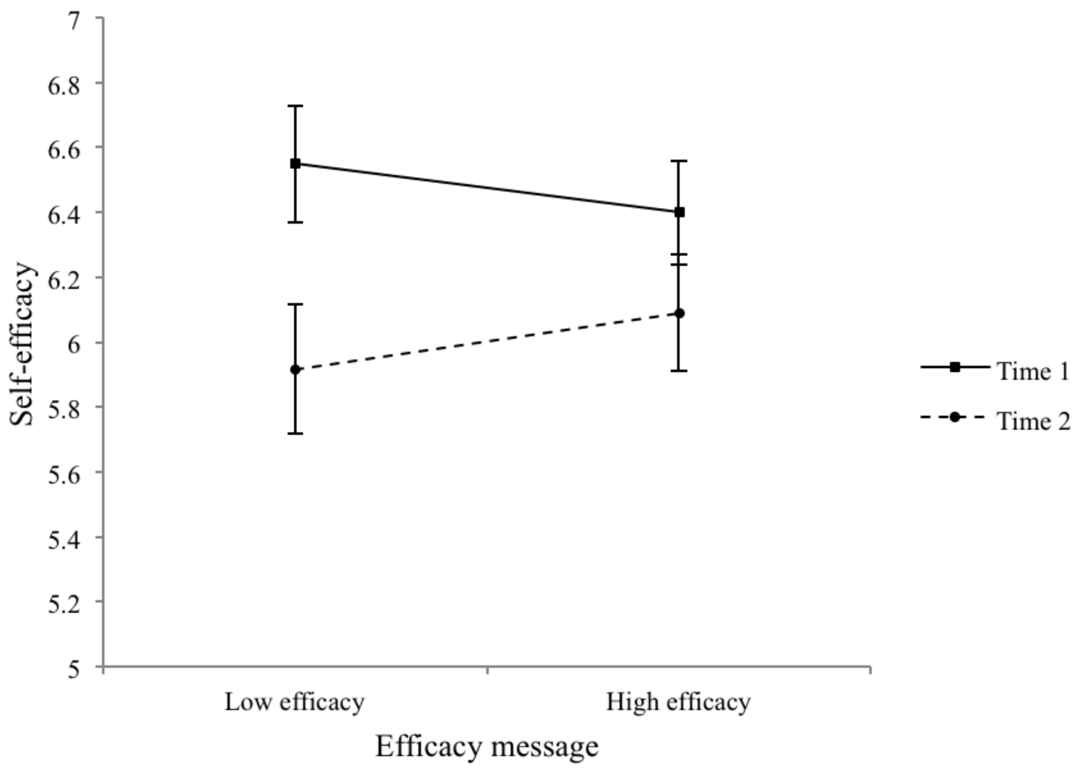

Figure 7.6. Proactive group data depicting a significant time by efficacy message group interaction effect on self-efficacy (fast food).

Response-efficacy.

No significant differences were found between response-efficacy at time 1 and time 2 for any of the health behaviours investigated (all *F*s < 3.65, all *p*s > .06). Further all two- and three-way interactions involving time as a repeated measures factor were non-significant (all *F*s < 2.24, all *p*s > .10). These findings suggest that no significant change in response-efficacy was recorded from baseline and psychographic group and efficacy message were not associated with change in response-efficacy perceptions between the baseline and intervention phases. These findings fail to support the predictions of the EIM.

Effect of the Health Message and Psychographic Groups on Changes in Attitudes and Intentions from Baseline

It was predicted that those who view a high threat high efficacy message should have the most positive attitudes and greatest intentions to engage in health protective behaviour. Further, it was predicted that proactive individuals should not change their attitudes or intentions following the presentation of any health message; responsive individuals attitudes will be less positive and their intentions weaker when presented with a low efficacy message; avoidant individuals' attitudes will be more positive and their intentions stronger when presented with a low threat high efficacy message; and indifferent individuals' attitudes will be more positive and their intentions stronger when presented with a high threat high efficacy message. Analyses of variance were utilised to test these predictions. Four-way (4 [psychographic group: responsive, proactive, avoidant, indifferent]*3 [Threat message: low, moderate, high]*2 [efficacy message: low high]*2 [time: baseline phase, intervention phase]) mixed ANOVAs were utilised to investigate the direct effects of psychographic group, threat and efficacy message on changes in attitudes and intentions between the baseline and intervention phases of the study. The within subjects factor was time; participants' responses at baseline were compared to their responses during the intervention phase in order to ascertain whether any changes had occurred following the presentation of the health message. As separate measures of attitudes and intentions are utilised for each of the health behaviours investigated, separate ANOVAs were calculated for each of the health behaviours. Power to detect a medium effect size (f = .25, η_p^2 = .06) exceeded .80 for all analyses; power to detect a large effect size (f = .40, η_p^2 = .16) exceeded .99.

Attitudes.

***Exercise 30 mins*.** A significant main effect of time was recorded for attitudes concerning exercising 30 minutes per day five days per week ($F(1,201) = 4.97$, $p < .05$, $\eta_p^2 = .03$). Participants' attitudes were significantly more positive during the intervention phase ($M = 6.35$, $SD = .99$) when compared with baseline ($M = 6.21$, $SD = 1.12$). However, no significant interaction effects were found (all Fs < 1.44, all ps > .20). This suggests that individuals' attitudes concerning exercise became more positive over time, but this change is not attributable to the threat or efficacy message content or the individuals' psychographic characteristics.

***Dietary Behaviours*.** Four-way mixed ANOVAs revealed that no significant differences in attitudes were recorded between the baseline and intervention phases of the research for each of the dietary behaviours investigated (all Fs < .80, all ps > .37). Further, no two- three or four-way interaction effects were found (all Fs < 1.71, all ps > .13). These findings suggest that the presentation of the health message and participants' psychographic characteristics did not affect change in their attitudes from baseline. Taken together these findings do not support the predictions of thhe EIM.

Intentions.

Four-way mixed ANOVA analyses revealed only two significant effects across all six health behaviours. A significant main effect of time was found for intentions to exercise for 30 minutes per day five days per week ($F(1,201) = 5.64$, $p < .05$, $\eta_p^2 = .03$) and intentions to maintain a healthy diet ($F(1,201) = 4.21$, $p < .05$, $\eta_p^2 = .02$). In both cases intentions were stronger during the intervention phase when compared with baseline. All other main effects and interactions were non-significant (all Fs < 2.54, all ps > .05). This suggests that for all six health behaviours the health message and psychographic group did not affect change in participants' intentions when compared with baseline intentions. Further for four of the six health behaviour no change in intentions was recorded over time.

Effect of the Health Message and Psychographic Groups on Changes in Threat and Efficacy Health Knowledge from Baseline

The EIM predicted that only avoidant individuals should gain health knowledge following the presentation of the health message, and that these individuals will be most likely to gain health knowledge when presented with a low threat high efficacy message. Four-way (4 [psychographic group: responsive, proactive, avoidant, indifferent]*3 [Threat message: low, moderate, high]*2 [efficacy message: low high]*2 [time: baseline phase, intervention phase]) mixed ANOVAs were utilised to investigate the effects of psychographic group, threat and efficacy message on changes in threat and efficacy health knowledge between the baseline and intervention phases of the study. Power to detect a medium effect size (f = .25, η_p^2 = .06) exceeded .80 for all analyses; power to detect a large effect size (f = .40, η_p^2 = .16) exceeded .99.

Threat health knowledge.

A significant main effect of time on threat health knowledge was found (F(1,189) = 5.79, $p < .05$, η_p^2 = .03). Threat health knowledge was found to be greater during the intervention phase (M = 3.18, SD = 1.90) when compared with baseline (M = 2.88, SD = 1.62). However, this main effect must be qualified by a significant time by psychographic group interaction (F(3,189) = 2.77, $p < .05$, η_p^2 = .04). The difference in threat health knowledge between the baseline and intervention phases was only found in the avoidant group. No differences were found for all other psychographic groups (see figure 7.7). No other two- three- or four-way interactions were found for health knowledge (all Fs < 1.83, all ps > .16).

Efficacy health knowledge.

No significant main effects or interactions were found for efficacy health knowledge. (all *F*s < 1.31, all *p*s > .27). Contrary to predictions, these findings suggest that no changes in efficacy health knowledge were recorded between the baseline and intervention phases of the study.

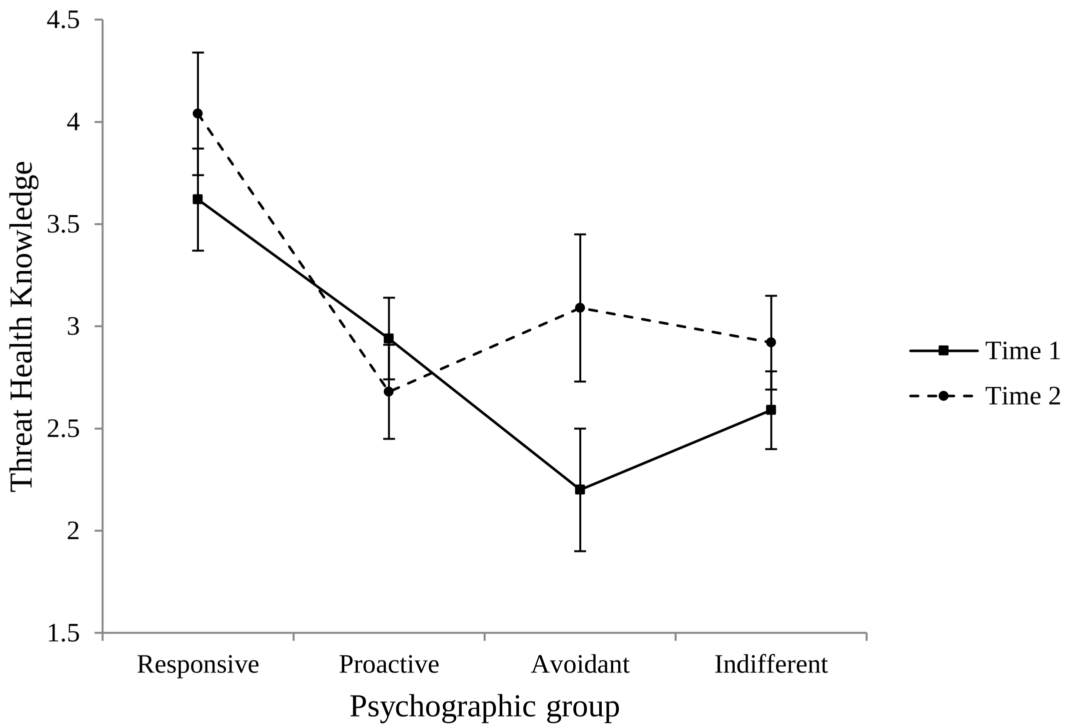

Figure 7.7. Threat health knowledge as a function of time and psychographic group**.**

Effect of the Health Message and Psychographic Group on Fear

The EIM predicts that high threat messages will be associated with increased fear. Further, it was predicted that the avoidant group will experience the greatest fear in response to a high threat message when compared with the responsive, proactive and indifferent groups. A two-way (4 [psychographic group] * 3 [threat]) between subjects ANOVA was utilised to test these predictions. As predicted a main effect of threat message was found ($F(2,221) = 15.97$, $p < .001$, $\eta_p^2 = .13$). Tukey's HSD revealed that those who viewed the high threat message ($M = 4.20$, $SD = 1.54$) experienced greater fear than those in the moderate (*M* = 3.50, *SD* = 1.43) and low threat groups (*M* = 2.86, *SD* = 1.51). The difference between the moderate and low threat groups was also significant. This suggests that individuals' perceptions of fear increased with the intensity of the threat message. A significant main effect of psychographic group was also found ($F(3,221) = 3.47$, $p < .05$, $\eta_p^2 = .04$). Those in the proactive group (*M* = 3.25, *SD* = 1.63) reported significantly less fear than the avoidant group (*M* = 4.13, *SD* = 1.46). No other significant differences were recorded between the psychographic groups. Contrary to predictions the threat message * psychographic interaction effect was non-significant ($F(6,221) = .69$, $p = .66$, $\eta_p^2 = .02$).

Effect of the Health Message and Psychographic Group on Minimising Thoughts

The EIM predicted that those who viewed the high threat message would generate the greatest number of minimising thoughts. Avoidant individuals were also predicted to generate the greatest number of minimising thoughts, especially in response to a high threat message. A 4 (psychographic group) * 3 (threat) between subjects ANOVA was utilised to test these predictions.

Two-way ANOVA revealed a significant main effect of threat message ($F(2,208) = 3.38$, $p < .05$, $\eta_p^2 = .03$). Those who viewed the high threat message (*M* = .40, *SD* = .93) were more likely to generate a greater number of minimising thoughts when compared with those who viewed the moderate (*M* = .23, *SD* = .55) or low threat messages (*M* = .22, *SD* = .61). The difference between the moderate and low threat group was non-significant. However, this main effect must be interpreted in light of a significant threat * psychographic group interaction effect ($F(6,221) = 2.23$, $p < .05$, $\eta_p^2 = .06$). Investigation of the simple effects revealed that the effect of threat on minimising thoughts was present in the avoidant and indifferent groups only (see figure 7.8). For the avoidant group, those who viewed the high threat message reported more minimising thoughts than both the moderate and low threat message groups. For the indifferent group, those who viewed the high threat message reported more minimising thoughts than the moderate threat group only. The main effect of psychographic group was non-significant (F(6,221) = .45, p = .72, η_p^2 = .01). These findings support the predictions of the EIM.

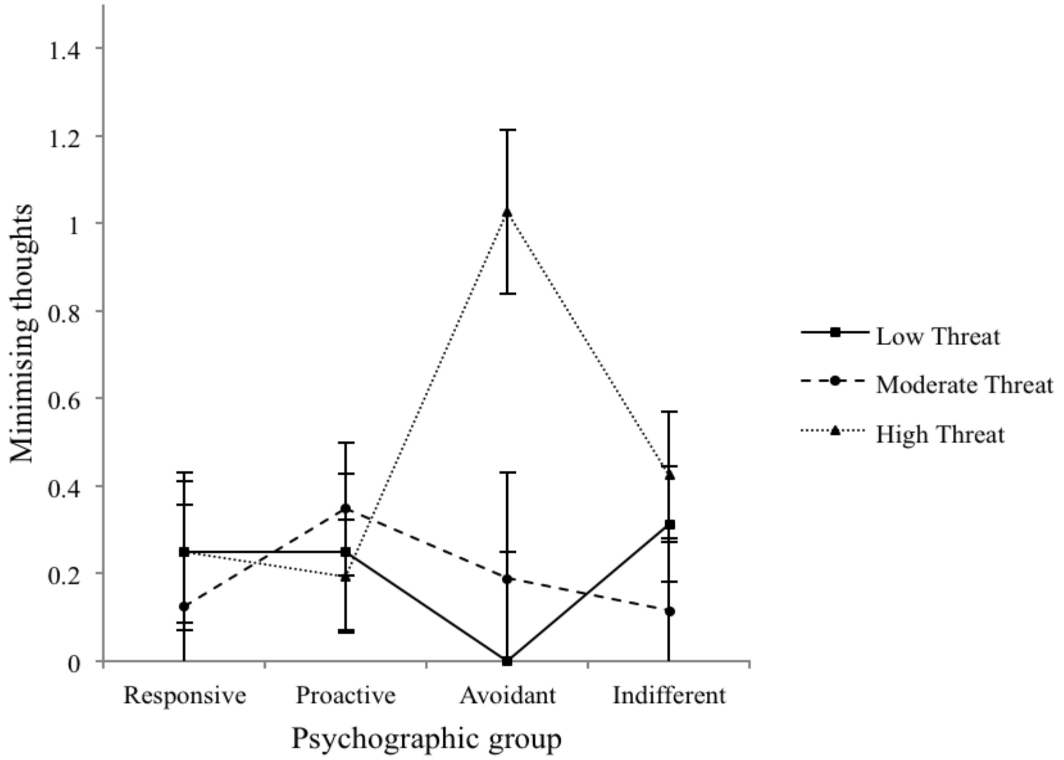

Figure 7.8. Minimising thoughts as a function of threat message and psychographic group.

Effect of the Health Message and Psychographic Group on Positive Thoughts About the Recommendation

It was predicted that those who viewed the high efficacy message would produce more positive thoughts about the recommendation; and responsive individuals will generate the greatest number of positive thoughts about the recommendation. Analysis of variance was utilised to investigate the effects of efficacy message and psychographic group on positive thoughts about the recommendation. A significant main effect of psychographic group on positive thoughts about the recommendation was found (F(3,208) = 3.92, p < .01, η_p^2 = .05). Tukey's post-hoc tests revealed that the avoidant group (M = .83, SD = .85) produced significantly more positive thoughts about the recommendation when compared with the indifferent group (M = .43, SD = .57). All other differences between psychographic groups were non-significant. The predicted main effect of efficacy (F(1,208) = .03, p = .87, η_p^2 < .001) and efficacy * psychographic group interaction (F(3,208) = .06, p = .98, η_p^2 <.001) were both non-significant.

Effect of the Health Message and Psychographic Group on Maladaptive Responses

The EIM predicts that those exposed to high threat low efficacy messages should engage in maladaptive responses (i.e., cognitive and behavioural avoidance and reactance). Further, it was predicted that avoidant individuals will be most likely to engage in maladaptive responses, especially in response to high threat messages. In order to test these predictions three-way (4 [psychographic group] * 3 [threat] * 2[efficacy]) between subjects ANOVAs were utilised. Seperate analyses were conducted for cognitive avoidance, behavioural avoidance and reactance.

Cognitive avoidance.

Three-way ANOVA revealed a significant main effect of psychographic group (F(3,203) = 5.67, p < .001, η_p^2 = .08). Those in the responsive group (M = 2.30, SD = 1.44) reported significantly less cognitive avoidance when compared with both the proactive (M = 3.13, SD = 1.65) and indifferent groups (M = 3.54, SD = 1.66). Contrary to predictions the avoidant group did not differ from any of the remaining three psychographic groups. Further, contrary to predictions no other main or interaction effects were observed (all Fs < .82, all ps > .48).

Behavioural avoidance.

Three-way ANOVA revealed a significant main effect of psychographic group ($F(3,203) = 4.46$, $p < .005$, $\eta_p^2 = .06$). Tukey's HSD revealed that those in the responsive group ($M = 1.66$, $SD = 1.02$) reported significantly less behavioural avoidance when compared with the indifferent group ($M = 2.40$, $SD = 1.28$). All other differences between psychographic groups were non-significant. Further, contrary to predictions no other main or interaction effects were observed (all Fs < 1.68, all ps > .18).

Reactance.

Three-way ANOVA revealed a significant main effect of threat ($F(1,203) = 5.89$, $p < .005$, $\eta^2 = .05$). Tukey's HSD revealed that those who viewed the high threat message ($M = 3.05$, $SD = 1.32$) reported significantly greater reactance when compared with those who viewed the moderate ($M = 2.46$, $SD = 1.14$) or low threat message ($M = 2.56$, $SD = 1.16$). This suggests that the presentation of a highly threatening message is more likely to elicit reactance responses when compared with a moderately or minimally threatening message. No other significant main or interaction effects were found (all Fs < 2.06, all ps > .13). The predicted threat by efficacy interaction effect was not observed. Further, avoidant participants were no more likely to engage in reactance than responsive, proactive or indifferent participants. These findings provide partial support to the predictions of the EIM.

Correlations between Predictor and Outcome Variables within the Extended Integrated Model

The EIM made several predictions concerning which variables should be associated (see figure 7.1). Fear was predicted to be positively associated with susceptibility, severity, minimising thoughts and maladaptive responses (cognitive and behavioural avoidance and reactance). Minimising thoughts were predicted to be positively associated with fear, susceptibility, severity and maladaptive responses; and negatively associated with attitudes, intentions and behaviour. And positive thoughts about the recommendation were predicted to be positively associated with perceived susceptibility, severity, self- and response-efficacy, attitudes, intentions and behaviour; and negatively associated with maladaptive responses. Pearson's correlations were utilised to test these predictions. Intercorrelations between predictor and outcome variables were calculated for each of the health behaviours investigated.

Correlations between variables common to all health behaviours. Many variables measured during the intervention phase were common to all health behaviours. These variables included perceived susceptibility and severity, fear, minimising responses, positive thoughts about the recommendation, cognitive and behavioural avoidance, reactance and threat and efficacy health knowledge. To avoid duplication, correlations between these variables were considered separately. Fear was found to be positively associated with perceived susceptibility, cognitive avoidance and reactance; but was not associated with severity, minimising thoughts and behavioural avoidance. Minimising thoughts were found to be positively associated with susceptibility and cognitive avoidance; but were not correlated with fear, severity, behavioural avoidance or reactance. As predicted, positive thoughts about the recommendation were found to be positively associated with susceptibility, severity and response-efficacy; and negatively associated with all fear control responses. Severity was found to be negatively associated with all three fear control responses. An unexpected finding was that both threat and efficacy health knowledge were negatively associated with all three fear control responses. This indicates that those who possessed greater knowledge were less likely to engage in maladaptive responses to the presented health message.

Exercise 30 mins.

Pearson correlations revealed that exercise behaviour was positively associated with intentions to exercise 30 minutes per day five days per week, self-efficacy and past exercise behaviour (see table 7.5). Exercise behaviour was also negatively associated with susceptibility and positive thoughts about the recommendation. Contrary to predictions, no significant relationships between fear control responses and exercise behaviour were found. Intentions were positively associated with attitudes, injunctive norms, descriptive norms, self-efficacy, perceived controllability, response-efficacy and past exercise behaviour. As predicted, intentions were also negatively associated with behavioural avoidance. Attitudes were found to be positively associated with severity and response-efficacy; they were also negatively associated with both cognitive and behavioural avoidance. As predicted, self-efficacy was positively associated with perceived controllability and past behaviour. However, contrary to predictions self-efficacy was not found to be associated with positive thoughts about the recommendation or health knowledge. Response-efficacy was found to be positively associated with both defensive message processing variables and negatively associated with behavioural avoidance and reactance.

Table 7.5

Correlation Matrix for Exercise Behaviour and Intentions and all Measured Predictors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Exercise behaviour (hrs)																		
2. Intentions	.26*																	
3. Attitudes	.06	.41**																
4. Injunctive norms	-.02	.35**	.41**															
5. Descriptive norms	.01	.29**	.09	.31**														
6. Self-efficacy	.47**	.72**	.32**	.22**	.30**													
7. Perceived controllability	.03	.43**	.29**	.29**	.21**	.55**												
8. Susceptibility	-.32*	-.12	.05	.05	-.09	-.19**	-.16*											
9. Severity	.00	.10	.25**	.25**	-.04	.02	.14	.15*										
10. Response-efficacy	-.06	.25**	.46**	.45**	.02	.26**	.48**	.05	.37**									
11. Fear	-.04	-.02	-.03	.07	.05	-.10	-.09	.29**	-.01	-.12								
12. Minimising thoughts	.00	-.06	.14*	.20**	-.05	-.03	.06	.20**	-.07	.16*	.05							
13. PTATR	-.33**	.04	.10	.18**	.04	.07	.17*	.15*	.21**	.18*	-.07	-.08						
14. Cognitive avoidance	.08	-.10	-.15*	-.08	.03	-.07	-.04	.01	-.28**	-.13	.14*	.16*	-.26**					
15. Behavioural avoidance	.01	-.23**	-.26**	-.31**	-.04	-.18*	-.26**	.07	-.33**	-.33**	-.07	.06	-.28**	.42**				
16. Reactance	.11	-.04	-.09	-.09	-.05	-.07	-.13	.09	-.22**	-.22**	.28**	.12	-.20**	.22**	.27**			
17. Threat HK	-.22	-.01	.14*	.15*	-.07	-.08	.08	.15*	.15*	.24**	-.02	.04	.13	-.21**	-.23**	-.16*		
18. Efficacy HK	-.07	.07	.21**	.13	-.06	-.03	-.01	.09	.11	.21**	-.03	-.03	.10	-.26**	-.17**	-.16*	.71**	
19. Past exercise (hrs)	.50**	.42**	.10	.03	.19**	.46**	.21**	-.14*	.01	.06	.02	-.11	-.10	-.18**	-.11	-.09	.03	.06

Note: HK = health knowledge, PTATR = positive thoughts about the recommendation. * = $p < .05$; ** = $p < .01$.

Healthy diet.

Four measures of unhealthy dietary practices were utilised in the study. Individuals indicated how often they consumed foods high in fat, fast food, soft drink and foods high in sugar. Those who have a healthy diet should consume less of these foods. Intercorrelations between dietary behaviours were moderate to strong (all *r*s between .43 and .73, all *p*s < .001; see table 7.6). Intake of foods high in fat was found to be positively associated with past intake of fatty foods, fast food and soft drink; and negatively associated with both intentions to avoid foods high in fat and self-efficacy. Intake of fast food was found to be positively associated with minimising thoughts and past intake of fatty foods, fast food and soft drink; and negatively associated with self-efficacy and intentions to avoid fast food. Intake of soft drink was found to be positively associated with past intake of fast food and soft drink; and negatively associated with self-efficacy. Intake of foods high in sugar was found to be positively associated with past intake of foods high in fat, fast food and foods high in sugar; and negatively associated with self-efficacy.

Intentions to maintain a healthy diet were found to be strongly associated with self-efficacy; moderately associated with attitudes, injunctive norms, descriptive norms perceived controllability and response-efficacy; and weakly associated with severity and threat and efficacy health knowledge. Intentions were also negatively associated with each of the three fear control responses and each of the four unhealthy past dietary behaviours (i.e., past intake of fatty foods, fast food, soft drink and foods high in sugar). As predicted, attitudes were found to be positively associated with severity and response-efficacy and positive thoughts about the recommendations; attitudes were also negatively associated with behavioural avoidance and reactance. However, contrary to predictions attitudes were not associated with perceived susceptibility. As predicted, self-efficacy was positively associated with perceived controllability and was negatively associated with three of the four past unhealthy behaviours (i.e., past intake of fatty foods, fast food and soft drink). Response-efficacy was found to be positively associated with positive thoughts about the recommendation and negatively associated with fear and all three fear control responses (see table 7.6).

Avoid foods high in fat.

Intake of fatty food was found to be positively associated with past intake of fatty food and was negatively associated with self-efficacy. Intentions to avoid foods high in fat were found to be positively associated with attitudes, injunctive norms, descriptive norms, self-efficacy, perceived controllability, severity, response-efficacy and threat and efficacy health knowledge. Intentions were also negatively associated with minimising thoughts, all three fear control responses and past intake of foods high in fat. As predicted, attitudes were found to be positively associated with severity and response-efficacy. Further attitudes were negatively associated with all three fear control responses. Self-efficacy was found to be positively associated with perceived controllability; it was also negatively associated with minimising thoughts and past intake of foods high in fat. Contrary to expectations self-efficacy was not associated with positive thoughts about the recommendation or health knowledge. Response-efficacy was positively associated with positive thoughts about the recommendation and negatively associated with all three fear control responses (see table 7.7).

Avoid fast food.

Pearson correlations revealed that intake of fast food was positively associated with minimising thoughts and past intake of fast food. Intake of fast food was negatively correlated with intentions to avoid fast food, self-efficacy and perceived controllability (see table 7.8). Intentions were positively associated with attitudes, injunctive norms, descriptive norms, self-efficacy, perceived controllability, severity and response-efficacy. As predicted, intentions were also negatively associated with all three fear control responses and past intake of fast food. Attitudes were found to be positively associated with severity, response-efficacy and positive thoughts about the recommendations; they were also negatively associated with all fear control responses. As predicted, self-efficacy was positively associated with perceived controllability, positive thoughts about the recommendations and threat and efficacy health knowledge; it was also negatively associated with past intake of fast food. However, contrary to predictions self-efficacy was not found to be associated with defensive message processing or health knowledge. Response-efficacy was found to be positively associated with positive thoughts concerning the recommendation and negatively associated fear control responses.

Avoid soft drink.

Pearson's correlations revealed significant positive associations between soft drink intake and past soft drink intake (see table 7.9). Soft drink intake was negatively associated with attitudes, intentions to avoid soft drink high in sugar and self-efficacy. Intentions were found to be strongly associated with self-efficacy and perceived controllability; moderately associated with attitudes and response-efficacy; and weakly associated with injunctive and descriptive norms, severity, positive thoughts about the recommendations and threat and efficacy health knowledge. Intentions were also negatively associated with each of the three fear control responses and past soft drink consumption. As predicted, attitudes were found to be positively associated with severity and response-efficacy and positive thoughts about the recommendations; attitudes were also negatively associated with all fear control responses. However, contrary to predictions attitudes were not associated with perceived susceptibility. Self-

Table 7.6.

Correlation Matrix for Adoption of Unhealthy Dietary Behaviours and Intentions to Maintain a Healthy Diet and all Measured Predictors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1. High fat foods intake																								
2. Fast food intake	.51*																							
3. Soft drink intake	.67*	.49*																						
4. High sugar foods intake	.73*	.48*	.43*																					
5. Intentions	-.26*	-.31*	-.15	-.20																				
6. Attitudes	-.21	-.25	-.14	-.10	.49*																			
7. Injunctive norms	-.22	.06	-.16	-.17	.38*	.38*																		
8. Descriptive norms	.10	.25	-.04	-.16	.30*	.16*	.53*																	
9. Self-efficacy	-.33*	-.43*	-.25*	-.41*	.63*	.30*	.29*	.37*																
10. Perceived controllability	-.24	-.17	-.18	-.28*	.49*	.37*	.42*	.31*	.64*															
11. Susceptibility	-.03	.23	-.13	.03	.01	-.02	-.02	-.15*	-.18*	.13														
12. Severity	-.01	-.04	.02	.03	.20*	.24*	.20*	.12	.16*	.15*	.15*													
13. Response-efficacy	-.02	-.06	-.03	-.04	.48*	.51*	.51*	.28*	.40*	.56*	-.10	.35*												
14. Fear	-.09	.16	-.09	-.14	-.09	-.06	-.07	-.06	-.09	-.14*	.29*	-.01	-.15*											
15. Minimising thoughts	.03	.33*	-.01	.04	-.06	.09	.09	.04	-.10	.08	.20*	-.07	.07	.05										
16. PTATR	-.14	-.05	-.10	.08	.12	.13	.22*	.04	.09	.20*	.15*	.21*	.18*	-.07	-.08									
17. Cognitive avoidance	.02	.08	.04	.01	-.22*	-.12	-.20*	-.11	-.06	-.08	.01	-.28*	-.12	.14*	.16*	-.26*								
18. Behavioural avoidance	.06	.02	-.04	.08	-.36*	-.28*	-.28*	-.15*	-.26*	-.22*	.07	-.33*	-.37*	-.07	.06	-.28*	.42*							
19. Reactance	.05	.13	.08	.02	-.25*	-.17*	-.13	-.13	-.15*	-.20*	.09	-.22*	-.28*	.28*	.12	-.20*	.22*	.27*						
20. Threat HK	.13	.09	.08	.13	.19*	.14*	.16*	-.01	.11	-.21*	.15*	.15*	.24*	-.02	.04	.13	-.21*	-.23*	-.16*					
21. Efficacy HK	.07	.06	.03	.09	.20*	.14*	.15*	.00	.10	.17*	.09	.11	.20*	-.03	-.03	.10	-.26*	-.17*	-.16*	.71*				
22. Past intake of fatty foods	.31*	.43*	.12	.37*	-.16*	.01	-.07	-.06	-.16*	-.14*	.12	.02	-.08	.00	.10	-.02	.10	.12	.03	.03	-.02			
23. Past intake of fast food	.25*	.78*	.29*	.38*	-.30*	-.07	-.03	-.10	-.31*	-.23*	.15*	-.04	-.09	.09	.13	-.06	.18*	.09	.07	-.11	-.16*	.24*		
24. Past intake of soft drink	.33*	.48*	.71*	.18	-.31*	-.13	-.16*	-.13	-.20*	-.21*	.13*	-.02	-.21*	.06	-.01	-.08	.24*	.18*	.09	-.24*	-.19*	.29*	.44*	
25. Past intake of sugar	.12	.15	.00	.45*	.23*	-.11	-.07	-.09	-.11	-.14*	.11	.03	-.07	.11	-.01	-.05	.19*	.22*	.21*	-.10	-.14*	.53*	.30*	.35*

Note: HK = health knowledge, PTATR = positive thoughts about the recommendation. * = $p < .05$.

Table 7.7

Correlation Matrix for Intake of Foods High in Fat and Intentions and all Measured Predictors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. High fat foods intake																		
2. Intentions	-.17																	
3. Attitudes	-.23	.45**																
4. Injunctive norms	-.08	.28**	.25**															
5. Descriptive norms	.03	.21**	.10	.33**														
6. Self-efficacy	-.33**	.60**	.26**	.13	.34**													
7. Perceived controllability	-.17	.44**	.34**	.29**	.21**	.60**												
8. Susceptibility	-.03	.00	.06	.09	-.16*	-.22**	-.02											
9. Severity	-.01	.26**	.23**	.26**	.16*	.15*	.23**	.15*										
10. Response-efficacy	-.03	.41**	.40**	.42**	.20**	.36**	.60**	-.01	.46**									
11. Fear	-.09	-.03	-.10	-.01	-.10	-.17*	-.17*	.29**	-.01	-.12								
12. Minimising thoughts	.03	-.18**	-.04	.12	-.04	-.16*	.07	.20**	-.07	.05	.05							
13. PTATR	-.14	.08	.13	.28**	.03	.05	.17*	.15*	.21**	.23**	-.07	-.08						
14. Cognitive avoidance	.02	-.23**	-.25**	-.20**	-.16*	-.09	-.10	.01	-.28**	-.16*	.14*	.16*	-.26**					
15. Behavioural avoidance	.06	-.42**	-.38**	-.21**	-.08	-.26**	-.30**	.07	-.33**	-.36**	-.07	.06	-.28**	.42**				
16. Reactance	.05	-.20**	-.19**	-.05	-.02	-.23**	-.29**	.09	-.22**	-.22**	.28**	.12	-.20**	.22**	.27**			
17. Threat HK	.13	.16*	.16*	.18**	.01	-.09	.23**	.15*	.15*	.23**	-.02	.04	.13	-.21**	-.23**	-.16*		
18. Efficacy HK	.07	.19**	.18**	.13	.00	-.13	.19**	.09	.11	.18*	-.03	-.03	.10	-.26**	-.17**	-.16*	.71**	
19. Past intake of fatty foods	.31**	-.38**	-.14*	-.06	.01	-.38**	-.23**	.12	.02	-.06	.00	.10	-.02	.10	.12	.03	.03	-.02

Note: HK = health knowledge, PTATR = positive thoughts about the recommendation. * = $p < .05$; ** = $p < .01$.

Table 7.8

Correlation Matrix for Intake of Fast Foods High in Fat and Intentions and all Measured Predictors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Fast foods intake																		
2. Intentions	-.30*																	
3. Attitudes	-.22	.51**																
4. Injunctive norms	.10	.23**	.23**															
5. Descriptive norms	.18	.25**	.21**	.45**														
6. Self-efficacy	-.61**	.67**	.32**	.08	.31**													
7. Perceived controllability	-.30**	.54**	.35**	.31**	.25**	.68**												
8. Susceptibility	.23	-.04	.07	.10	-.09	-.16*	.01											
9. Severity	-.04	.23**	.25**	.22**	.07	.22**	.22**	.15*										
10. Response-efficacy	.02	.39**	.39**	.56**	.28**	.36**	.54**	.03	.31**									
11. Fear	.16	-.01	-.03	.02	-.03	-.13	-.13	.29**	-.01	-.08								
12. Minimising thoughts	.33**	-.09	.04	.15*	.12	.13	.11	.20**	-.07	.09	.05							
13. PTATR	-.05	.14*	.17*	.20**	.12	.14*	.15*	.15*	.21**	.22**	-.07	-.08						
14. Cognitive avoidance	.08	-.24**	-.20**	-.12	-.16*	-.17*	-.06	.01	-.28**	-.13	.14*	.16*	-.26**					
15. Behavioural avoidance	.02	-.47**	-.37**	-.23**	-.22**	-.37**	-.28**	.07	-.33**	-.32**	-.07	.06	-.28**	.42**				
16. Reactance	.13	-.19**	-.17*	-.06	-.12	.21*	-.30**	.09	-.22**	-.21**	.28**	.12	-.20**	.22**	.27**			
17. Threat HK	.09	.23**	.19**	.11	.10	.16*	.30**	.15*	.15*	.18**	-.02	.04	.13	-.21**	-.23**	-.16*		
18. Efficacy HK	.06	.27**	.21**	.03	.09	.21**	.29**	.09	.11	.11	-.03	-.03	.10	-.26**	-.17**	-.16*	.71**	
19. Past intake of fast foods	.78**	-.41**	-.06	.07	-.16	-.48**	-.33**	.13*	-.02	-.11	.06	-.01	-.08	.24**	.18**	.09	-.24**	-.19**

Note: HK = health knowledge, PTATR = positive thoughts about the recommendation. * = $p < .05$; ** = $p < .01$.

Table 7.9

Correlation Matrix for Intake of Soft Drink High in Sugar and Intentions and all Measured Predictors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Soft drink intake																		
2. Intentions	-.42**																	
3. Attitudes	-.26*	.46**																
4. Injunctive norms	.08	.19**	.26**															
5. Descriptive norms	-.11	.20**	.13	.34**														
6. Self-efficacy	-.45**	.63**	.40**	.13	.23**													
7. Perceived controllability	-.17	.50**	.43**	.26**	.19**	.70**												
8. Susceptibility	-.13	.04	.03	.01	.06	-.02	.01											
9. Severity	.02	.18**	.28**	.23**	.15*	.26**	.22**	.15*										
10. Response-efficacy	.05	.44**	.37**	.48**	.20**	.48**	.54**	.09	.44**									
11. Fear	-.09	-.02	-.03	.02	-.01	-.09	-.13*	.29**	-.01	-.11								
12. Minimising thoughts	-.01	.03	.06	.21*	.15*	.09	.06	.20**	-.07	.07	.05							
13. PTATR	-.10	.15*	.21**	.22**	.14*	.21**	.19**	.15*	.21**	.18**	-.07	-.08						
14. Cognitive avoidance	.04	-.23**	-.18**	-.10	-.10	-.13	-.09	.01	-.28**	-.17*	.14*	.16*	-.26**					
15. Behavioural avoidance	-.04	-.40**	-.34**	-.20**	-.13	-.35**	-.32**	.07	-.33**	-.30**	-.07	.06	-.28**	.42**				
16. Reactance	.08	-.17*	-.22**	.01	-.08	.25**	-.23**	.09	-.22**	-.20**	.28**	.12	-.20**	.22**	.27**			
17. Threat HK	.08	.29**	.20**	.11	.08	.31**	.26**	.15*	.15*	.19**	-.02	.04	.13	-.21**	-.23**	-.16*		
18. Efficacy HK	.03	.24**	.19**	.06	.06	.26**	.26**	.09	.11	.13	-.03	-.03	.10	-.26**	-.17**	-.16*	.71**	
19. Past intake of soft drink	.71**	-.47**	-.24**	-.06	-.14*	-.43**	-.27**	.15*	-.04	-.02	.09	.13	-.06	.18**	.09	.07	-.11	-.16*

Note: HK = health knowledge, PTATR = positive thoughts about the recommendation. * = $p < .05$; ** = $p < .01$.

efficacy was positively associated with perceived controllability, positive thoughts about the recommendation and threat and efficacy health knowledge. Self-efficacy was also negatively associated with past soft drink consumption. Response-efficacy was found to be positively associated with positive thoughts about the recommendation and negatively associated with behavioural avoidance and reactance.

Avoid foods high in sugar.

Intake of foods high in sugar was positively associated with past intake of foods high in sugar; and negatively associated with intentions to avoid foods high in sugar and self-efficacy (see table 7.10). Contrary to predictions intake of foods high in sugar was not associated with fear control responses. Intentions were found to be positively associated with attitudes, injunctive norms, descriptive norms, self-efficacy, perceived controllability, severity, response-efficacy and threat and efficacy health knowledge. Intentions were also negatively associated with all three fear control responses and past intake of foods high in fat. As predicted, attitudes were found to be positively associated with severity, response-efficacy and positive thoughts about the recommendation. Further attitudes were negatively associated with all three fear control responses. Self-efficacy was found to be positively associated with perceived controllability; it was also negatively associated with past intake of foods high in sugar. Contrary to expectations self-efficacy was not associated with defensive message processing or health knowledge. Response-efficacy was positively associated with positive thoughts about the recommendation and negatively associated with all three fear control responses.

Table 7.10

Correlation Matrix for Intake of Foods High in Sugar and Intentions and all Measured Predictors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Sugar intake																		
2. Intentions	-.34*																	
3. Attitudes	-.15	.33**																
4. Injunctive norms	-.10	.24**	.29**															
5. Descriptive norms	-.23	.18**	.19**	.37**														
6. Self-efficacy	-.54*	.65**	.22**	.09	.24**													
7. Perceived controllability	-.23	.51**	.35**	.28**	.32**	.59**												
8. Susceptibility	.03	.00	.04	.06	-.09	-.08	-.14*											
9. Severity	.03	.14*	.25**	.18**	.14*	.04	.24**	.15*										
10. Response-efficacy	-.22	.36**	.40**	.35**	.35**	.42**	.70**	.00	.37**									
11. Fear	-.14	-.02	-.03	.11	-.06	-.12	.19**	.29**	-.01	-.17*								
12. Minimising thoughts	.04	-.09	.08	.13	.19**	.01	.07	.20**	-.07	.10	.05							
13. PTATR	.08	.06	.19**	.26**	.00	.01	.16*	.15*	.21**	.18**	-.07	-.08						
14. Cognitive avoidance	.01	-.18**	-.18**	-.13	-.05	-.08	-.10	.01	-.28**	-.15*	.14*	.16*	-.26**					
15. Behavioural avoidance	.08	-.35**	-.37**	-.24**	-.06	-.17*	-.31**	.07	-.33**	-.34**	-.07	.06	-.28**	.42**				
16. Reactance	.02	-.20**	-.21**	-.04	-.07	-.10	-.28**	.09	-.22**	-.29**	.28**	.12	-.20**	.22**	.27**			
17. Threat HK	.13	.19**	.19**	.17*	.01	.10	.23**	.15*	.15*	.20**	-.02	.04	.13	-.21**	-.23**	-.16*		
18. Efficacy HK	.09	.20**	.20**	.13	.03	.13	.19**	.09	.11	.20**	-.03	-.03	.10	-.26**	-.17**	-.16*	.71**	
19. Past intake of sugar	.45**	-.32**	-.18*	.02	-.12	-.22**	-.21**	.11	.03	-.13	.11	-.01	-.05	.19**	.22**	.21**	-.10	-.14*

Note: HK = health knowledge, PTATR = positive thoughts about the recommendation. * = $p < .05$; ** = $p < .01$.

Path analyses investigating the determinants of self-efficacy, maladaptive responses, and health protective attitudes, intentions and behaviour

The EIM made predictions concerning the determinants of several outcomes including maladaptive responses (cognitive and behavioural avoidance and reactance), self-efficacy, attitudes, intentions and behaviour. The EIM has a hierarchical structure such that proximal determinants of health protective behaviour (i.e., intentions and self-efficacy; see figure 7.1) are in turn determined by more distal predictors (e.g., past behaviour, perceived controllability, attitudes and injunctive and descriptive norms). Attitudes in turn are determined by even more distal predictors (e.g., perceived threat and response-efficacy). In order to test these predictions a path analysis was constructed utilising successive regression analyses. Separate regression analyses were performed for each of the outcome measures including: cognitive and behavioural avoidance, reactance, self-efficacy, attitudes, intentions and behaviour. Power to detect a medium effect size ($f^2 = .25$) exceeded .95, and exceeded .99 to detect a large effect size ($f^2 = .40$) for all analyses. The results of these analyses for each of the health behaviours investigated are summarised in table 7.11.

Hierarchical regression analyses investigating the predictors of self-efficacy. The EIM predicted that self-efficacy regarding the adoption of healthy diet and exercise behaviours would be determined by perceived controllability, past healthy behaviour, descriptive norms, positive thoughts about the recommendation and health knowledge (see figure 7.1). Hierarchical regression analyses were utilised to investigate these predictions. Separate analyses were performed for each of the six health behaviours investigated. Block 1 contained perceived controllability, and block 2 contained past behaviour. The past behaviour variables differed for each of the health behaviours investigated; only the corresponding health behaviour was utilised as a measure of past behaviour in each analysis (i.e., past exercise behaviour for exercise 30 minutes per day five days per week etc.). Past intake of fatty foods, fast food, soft drink and foods high in sugar were each utilised as measures of past behaviour for maintaining a healthy diet. Block 3 contained descriptive norms; block 4 contained positive thoughts about the recommendation; and block 5 contained the health knowledge variables (i.e., threat and efficacy health knowledge; see table 7.11).

***Exercise 30 Mins*.** Hierarchical regression analysis revealed a significant model which explained 44.35% of the variance in self-efficacy ($F(6,202) = 28.63$, $p < .001$, $f^2 = .80$). Perceived controllability was found to explain 29.13% ($F(1,207) = 86.50$, $p < .001$) and past exercise behaviour explained a further 12.39% ($\Delta F(1,206) = 44.84$, $p < .001$). Descriptive norms explained a further 1.45% ($\Delta F(1,205) = 6.27$, $p < .05$). Positive thoughts about the recommendation was not a significant predictor ($\Delta F(1,204) = .07$, $p = .80$). Threat and efficacy health knowledge together explained a further 1.64% ($\Delta F(2,202) = 4.01$, $p < .05$). However, only threat health knowledge was a significant predictor, registering a negative β-value.

***Healthy Diet*.** Perceived controllability was found to explain 40.15% of the variance in self-efficacy ($F(1,207) = 140.53$, $p < .001$). The past behaviour variables explained a further 1.99% ($\Delta F(4,203) = 2.78$, $p < .05$). However, only past fast food intake was a significant predictor. Descriptive norms explained a further 3.16% ($\Delta F(4,202) = 12.74$, $p < .001$). Positive thoughts about the recommendation ($\Delta F(1,201) = .35$, $p = .56$) and health knowledge ($\Delta F(2,199) = .01$, $p = .99$) each did not explain further unique variance. The final model explained 44.58% of the variance in self-efficacy ($F(9,199) = 19.59$, $p < .001$, $f^2 = .80$).

Table 7.11

Results of Hierarchical Regression Analyses Investigating the Predictions of the EIM for each of the Six Health Behaviours Investigated

	Exercise 30 Mins		Healthy Diet		Avoid Fat		Avoid Fast Food		Avoid Soft Drink		Avoid Sugar	
Predictor	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}
Self-efficacy												
Step 1: Perceived controllability	.54****	.29****	.64****	.40****	.60****	.36****	.68****	.46****	.70****	.49****	.59****	.34****
Step 2: Perceived controllability	.47****	.42****	.60****	.42*	.54****	.41****	.59****	.55****	.63****	.53****	.57****	.35
Past behaviour$_1$												
Exercise	.36****											
Fatty foods			-.04		-.25****							
Fast food			-.18***				-.32****					
Soft drink			.00						-.22****			
Sugary food			.05								-.10	
Step 3: Perceived controllability	.44****	.43*	.54****	.45****	.49****	.47****	.57****	.56*	.62****	.54	.55****	.35
Past behaviour$_1$												
Exercise	.34****											
Fatty foods			-.05		-.27****							
Fast food			-.18***				-.31****					
Soft drink			.01						-.21****			
Sugary food			.05								-.10	
Descriptive norms	.14*		.19****		.24****		.11*		.08		.06	

Table 7.11 continued

	Predictor	Exercise 30 Mins		Healthy Diet		Avoid Fat		Avoid Fast Food		Avoid Soft Drink		Avoid Sugar	
		β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}
Step 4:	Perceived controllability	.44****	.43	.55****	.45	.50****	.46	.56****	.56	.61****	.54*	.58****	.35
	Past behaviour$_1$												
	Exercise	.34****											
	Fatty foods			-.04		-.27****							
	Fast food			-.18***				-.31****					
	Soft drink			.01						-.21****			
	Sugary food			.06								-.10	
	Descriptive norms	.14*		.19****		.24****		.11*		.07		.05	
	PTATR	.01		-.03		-.04		.01		.10*		-.09	
Step 5:	Perceived controllability	.46****	.44*	.55****	.45	.50****	.46	.57****	.56	.60****	.54	.59****	.35
	Past behaviour$_1$												
	Exercise	.35****											
	Fatty foods			-.04		-.26****							
	Fast food			-.18***				-.31****					
	Soft drink			.01						-.20****			
	Sugary food			.05								-.10	
	Descriptive norms	.12*		.19****		.24****		.11*		.07		.05	
	PTATR	.03		-.03		-.04		.02		.09		-.09	
	Threat HK	-.20**		.00		-.08		-.08		.07		-.10	
	Efficacy HK	.10		-.01		.09		.06		-.02		.09	
Cognitive Avoidance													
Step 1:	Susceptibility	.02	.09****	.03	.09****	.02	.09****	.01	.10****	.03	.09****	.02	.09****
	Severity	-.33****		-.33****		-.32****		-.30****		-.31****		-.32****	
	Response-efficacy	.01		-.01		.00		-.01		-.02		-.01	
	Self-efficacy	-.06		.00		-.04		-.10		-.04		-.06	

Table 7.11 continued

	Predictor	Exercise 30 Mins β	Exercise 30 Mins R^2_{Adj}	Healthy Diet β	Healthy Diet R^2_{Adj}	Avoid Fat β	Avoid Fat R^2_{Adj}	Avoid Fast Food β	Avoid Fast Food R^2_{Adj}	Avoid Soft Drink β	Avoid Soft Drink R^2_{Adj}	Avoid Sugar β	Avoid Sugar R^2_{Adj}
Step 2:	Susceptibility	.04	.10	.05	.08	.03	.10	.04	.15***	.05	.10	.05	.10
	Severity	-.33****		-.33****		-.38****		-.32****		-.31****		-.31****	
	Response-efficacy	-.02		-.01		-.01		-.07		-.02		-.01	
	Self-efficacy	-.07		-.01		.00		-.07		-.05		-.06	
	Susc*SE	.07		-.05		-.10		-.23***		-.04		-.13	
	Sev*SE	.02		.05		.05		.18*		.01		-.04	
	Susc*RE	-.10		-.04		.01		.10		.04		-.02	
	Sev*RE	-.12		-.10		-.18*		-.28****		-.17*		-.05	
Step 3:	Susceptibility	.00	.11	.01	.10*	.00	.11	.00	.16	.01	.11*	.01	.11
	Severity	-.32****		-.32****		-.37****		-.31****		-.31****		-.31****	
	Response-efficacy	-.01		.00		.00		-.05		-.02		.01	
	Self-efficacy	-.06		-.01		.01		-.06		-.04		-.06	
	Susc*SE	.05		-.05		-.09		-.23***		-.04		-.13	
	Sev*SE	.02		.06		.03		.18*		.01		-.04	
	Susc*RE	-.10		-.05		.01		.10		.03		-.02	
	Sev*RE	-.13		-.11		-.17*		-.28****		-.18*		-.06	
	Fear	.13		.14*		.12		.13		.14*		.13	
Step 4:	Susceptibility	-.01	.14*	.00	.13*	-.01	.14*	.01	.18	.01	.14*	.01	.15*
	Severity	-.27****		-.27****		-.32****		-.29****		-.27****		-.25***	
	Response-efficacy	-.03		.00		.00		-.04		-.01		.00	
	Self-efficacy	-.05		.01		.02		-.05		-.04		-.06	
	Susc*SE	.07		-.03		-.04		-.22**		-.05		-.10	
	Sev*SE	.01		.04		-.02		.15		.00		-.10	
	Susc*RE	-.09		-.06		-.01		.11		.06		-.03	
	Sev*RE	-.11		-.09		-.13		-.25***		-.14*		.00	
	Fear	.11		.12		.11		.12		.12		.11	
	Minimising thoughts	.13		.12		.12		.06		.09		.12	
	PTATR	-.14*		-.16*		-.15*		-.13		-.15*		-.17*	

Table 7.11 continued

Predictor		Exercise 30 Mins		Healthy Diet		Avoid Fat		Avoid Fast Food		Avoid Soft Drink		Avoid Sugar	
		β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}
Behavioural Avoidance													
Step 1:	Susceptibility	.09	.19****	.05	.21****	.06	.19****	.06	.22****	.11	.22****	.09	.19****
	Severity	-.31****		-.29****		-.28****		-.29****		-.29****		-.31****	
	Response-efficacy	-.20***		-.22***		-.18*		-.09		-.13		-.21**	
	Self-efficacy	-.10		-.12		-.14*		-.26****		-.21***		-.06	
Step 2:	Susceptibility	.10	.19	.07	.21	.06	.20	.07	.21	.10	.25**	.10	.19
	Severity	-.29****		-.31****		-.24***		-.30****		-.30****		-.29****	
	Response-efficacy	-.23***		-.24***		-.17*		-.11		-.19**		-.22***	
	Self-efficacy	-.09		-.12		-.16*		-.25****		-.15*		-.05	
	Susc*SE	.01		.09		.11		-.03		.24***		.09	
	Sev*SE	-.07		.00		-.16*		.00		-.03		-.10	
	Susc*RE	-.06		.00		-.09		.02		-.20*		-.12	
	Sev*RE	-.09		-.12		.13		-.09		-.04		.00	
Step 3:	Susceptibility	.15*	.21*	.11	.23*	.10	.22*	.12	.23*	.14*	.27*	.15*	.21*
	Severity	-.30****		-.31****		-.25***		-.30****		-.31****		-.29****	
	Response-efficacy	-.25****		-.25****		-.19*		-.13		-.19**		-.24***	
	Self-efficacy	-.09		-.12		-.16*		-.26****		-.16*		-.06	
	Susc*SE	.03		.10		.10		-.03		.24****		-.09	
	Sev*SE	-.07		.00		-.13		.01		-.03		-.10	
	Susc*RE	-.07		.00		-.08		.02		-.19*		-.12	
	Sev*RE	-.08		-.10		.12		-.09		-.03		.01	
	Fear	-.16*		-.15*		-.14*		-.16*		-.15*		-.17*	

Table 7.11 continued

Predictor		Exercise 30 Mins β	Exercise 30 Mins R^2_{Adj}	Healthy Diet β	Healthy Diet R^2_{Adj}	Avoid Fat β	Avoid Fat R^2_{Adj}	Avoid Fast Food β	Avoid Fast Food R^2_{Adj}	Avoid Soft Drink β	Avoid Soft Drink R^2_{Adj}	Avoid Sugar β	Avoid Sugar R^2_{Adj}
Step 4:	Susceptibility	.17*	.24**	.14*	.26***	.12	.25***	.15*	.26**	.16*	.29*	.16*	25***
	Severity	-.26****		-.28****		-.20**		-.28****		-.29****		-.23***	
	Response-efficacy	-.24***		-.23***		-.16*		-.09		-.17*		-.24***	
	Self-efficacy	-.08		-.10		.16*		-.25****		-.15*		-.06	
	Susc*SE	.03		.11		.11		-.03		.23***		.10	
	Sev*SE	-.08		-.01		-.16*		-.01		-.04		-.15	
	Susc*RE	-.04		.00		-.07		.06		-.15*		-.10	
	Sev*RE	-.07		-.10		.15*		-.06		-.01		.06	
	Fear	-.18**		-.18**		-.16*		-.18**		-.17**		-.19***	
	Minimising thoughts	.04		.03		.05		-.03		.02		.05	
	PTATR	-.19***		-.20***		-.22***		.21***		-.16*		-.22***	
Reactance													
Step 1:	Susceptibility	.13	.08****	.10	.09****	.09	.09****	.11	.08****	.13	.10****	.12	.10****
	Severity	-.20**		-.18*		-.19*		-.19*		-.19**		-.17*	
	Response-efficacy	-.16*		.19*		-.08		-.08		-.07		-.24***	
	Self-efficacy	.00		-.03		-.15*		-.12		-.17*		.02	
Step 2:	Susceptibility	.14*	.08	.11	.08	.10	.10	.11	.07	.14*	.09	.13	.10
	Severity	-.19*		-.18*		-.21**		-.20*		-.22***		-.17*	
	Response-efficacy	-.16*		-.21**		-.10		-.09		-.07		-.24***	
	Self-efficacy	-.01		-.02		-.14		-.12		-.17*		.02	
	Susc*SE	.10		-.04		.02		.05		.04		.04	
	Sev*SE	.03		-.05		.02		-.09		-.12		-.02	
	Susc*RE	-.09		.01		-.13		-.04		.00		-.10	
	Sev*RE	-.05		-.04		-.09		-.01		.01		-.06	

Table 7.11 continued

		Exercise 30 Mins		Healthy Diet		Avoid Fat		Avoid Fast Food		Avoid Soft Drink		Avoid Sugar	
	Predictor	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}
Step 3:	Susceptibility	.07	.13****	.04	.14****	.03	.15****	.04	.13****	.06	.15****	.06	.15****
	Severity	-.19*		-.17*		-.20**		-.19**		-.21***		-.16*	
	Response-efficacy	-.13		-.18*		-.08		-.06		-.07		.20*	
	Self-efficacy	-.01		-.02		-.12		-.11		-.15*		.03	
	Susc*SE	.06		-.06		.04		.04		.05		.05	
	Sev*SE	.04		-.05		-.02		-.10		-.12		-.03	
	Susc*RE	-.08		.01		-.13		-.05		-.01		-.10	
	Sev*RE	-.06		-.04		-.07		-.02		.01		-.06	
	Fear	.25****		.27****		.25****		.27****		.26****		.25****	
Step 4:	Susceptibility	.05	.15*	.03	.16	.02	.17*	.03	.15	.06	.17	.04	.17*
	Severity	-.14		-.13		-.15		-.16*		-.17*		-.11	
	Response-efficacy	-.15*		-.19*		-.09		-.06		-.06		-.23***	
	Self-efficacy	.01		.00		-.10		-.09		-.15*		.04	
	Susc*SE	.08		-.03		.10		.07		.04		.08	
	Sev*SE	.02		-.06		-.08		-.13		-.13		-.07	
	Susc*RE	-.08		-.01		-.17*		-.05		.00		-.12	
	Sev*RE	-.04		-.04		-.04		.03		.02		-.01	
	Fear	.23***		.25****		.25****		.25****		.25****		.23****	
	Minimising thoughts	.13		.11		.14		.10		.10		.14*	
	PTATR	-.10		-.11		-.09		-.12		-.11		-.10	

Table 7.11 continued

	Predictor	Exercise 30 Mins		Healthy Diet		Avoid Fat		Avoid Fast Food		Avoid Soft Drink		Avoid Sugar	
		β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}
Attitudes													
Step 1:	Susceptibility	.10	.30****	.06	.28****	.11	.19****	.07	.21****	.01	.23****	.04	.20****
	Severity	.10		.06		.06		.19		.16*		.13	
	Response-efficacy	.19****		.47****		.34****		.30****		.23****		.37****	
	Self-efficacy	.26****		.12		.16*		.21***		.25****		.07	
Step 2:	Susceptibility	.09	.30	.05	.28	.10	.19	.07	.20	.02	.23	.03	.19
	Severity	.11		.05		.11		.08		.16*		.12	
	Response-efficacy	.39****		.47****		.35****		.31****		.23***		.37***	
	Self-efficacy	.27****		.12		.14*		.20***		.26****		.06	
	Susc*RE	.03		.07		-.08		-.02		-.07		.07	
	Sev*RE	.04		.04		.17*		.04		-.05		.03	
	Susc*SE	-.05		.06		.06		-.01		.00		-.04	
	Sev*SE	-.04		-.01		-.09		-.09		-.02		.06	
Step 3:	Susceptibility	.07	.30	.02	.28	.11	.19	.05	.20	-.01	.23	.00	.19
	Severity	.13		.06		.10		.18		.16*		.12	
	Response-efficacy	.37****		.45****		.35****		.29****		.21**		.34****	
	Self-efficacy	.28****		.13		.14		.20***		.25****		.07	
	Susc*RE	.03		.06		-.07		-.05		-.10		.04	
	Sev*RE	.05		.05		.16*		.04		-.05		.03	
	Susc*SE	-.04		.07		.04		.00		.00		-.02	
	Sev*SE	-.05		-.02		-.08		-.10		-.02		.07	
	Minimising thoughts	.08		.08		-.03		.06		.04		.06	
	PTATR	-.05		.02		.01		.06		.11		.11	

Table 7.11 continued

Predictor		Exercise 30 Mins		Healthy Diet		Avoid Fat		Avoid Fast Food		Avoid Soft Drink		Avoid Sugar	
		β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}	β	R^2_{Adj}
Step 4:	Susceptibility	.08	.30	.03	.27	.14*	.24****	.08	.23*	.02	.24*	.03	.22*
	Severity	.11		.04		.02		.00		.10		.06	
	Response-efficacy	.36****		.43****		.30****		.27****		.18*		.28****	
	Self-efficacy	.27****		.12		.09		.15*		.21***		.06	
	Susc*RE	.03		.06		-.09		-.02		-.12		.01	
	Sev*RE	.05		.04		.18*		.01		-.05		.03	
	Susc*SE	.04		.08		.07		-.02		.04		.00	
	Sev*SE	.06		-.02		-.13		-.09		-.03		.04	
	Minimising thoughts	.08		.08		-.01		.06		.05		.08	
	PTATR	-.06		.00		-.07		.00		.07		.05	
	Cognitive avoidance	-.03		.00		-.06		-.05		-.02		.00	
	Behaviour avoidance	-.09		-.07		-.27****		-.22***		-.16*		-.21**	
	Reactance	.03		-.01		-.04		-.03		-.06		-.06	
Intentions													
Step 1:	Attitudes	.31****	.20****	.41****	.28****	.40****	.22****	.47****	.26****	.43****	.20****	.29****	.12****
	Injunctive norms	.22***		.22****		.18***		.12		.08		.15*	
Step 2:	Attitudes	.13*	.57****	.29****	.50****	.28****	.46****	.30****	.55****	.23****	.44****	.16***	.47****
	Injunctive norms	.15***		.12*		.15**		.12*		.07		.14*	
	Self-efficacy	.65****		.51****		.51****		.57****		.53****		.60****	
Step 3:	Attitudes	.14**	.57	.29****	.50	.28****	.46	.30****	.55	.23****	.44	.16***	.47
	Injunctive norms	.14*		.11		.16***		.14**		.06		.16**	
	Self-efficacy	.63****		.50****		.52****		.58****		.52****		.61****	
	Descriptive norms	.05		.01		-.05		-.05		.03		-.07	

Table 7.11 continued

	Predictor	Exercise 30 Mins β	Exercise 30 Mins R^2_{Adj}	Healthy Diet β	Healthy Diet R^2_{Adj}	Avoid Fat β	Avoid Fat R^2_{Adj}	Avoid Fast Food β	Avoid Fast Food R^2_{Adj}	Avoid Soft Drink β	Avoid Soft Drink R^2_{Adj}	Avoid Sugar β	Avoid Sugar R^2_{Adj}
Step 4:	Attitudes	.14*	.57	.27****	.52**	.23****	.48*	-.26****	.57*	.20****	.45*	.10	.49**
	Injunctive norms	.13*		.08		.13*		.12*		.04		.13*	
	Self-efficacy	.63****		.48****		.50****		.54****		.50****		.59****	
	Descriptive norms	.06		.00		-.05		-.06		.02		-.06	
	Cognitive avoidance	-.01		-.08		-.05		-.04		-.08		-.02	
	Behavioural avoidance	-.05		-.07		-.15*		-.15**		-.12*		-.15**	
	Reactance	.03		-.10		.02		.02		.05		-.07	
Behaviour													
Step 1:	Intentions	.27*	.06*			-.17	.01	-.30*	.08*	-.42****	.16****	-.34**	.10**
Step 2:	Intentions	-.13	.20***			-.03	.08*	-.06	.34****	-.18	.30****	-.12	.28****
	Self-efficacy	.56***				-.31*		-.57****		-.46****		-.48****	
Step 3:	Intentions	-.09	.27*			-.07	.09	-.07	.55****	-.11	.48****	-.13	.31
	Self-efficacy	.38*				-.18		-.16		-.02		-.35*	
	Past behaviour$_1$												
	Exercise	.32*											
	Fatty foods					.20							
	Fast food							.62****					
	Soft drink									.65****			
	Sugary food											-.24	

Note. PBC = Perceived behavioural control, Susc*RE = susceptibility*self-efficacy, Sev*RE = severity*self-efficacy, Susc*RE = susceptibility*response-efficacy, Sev*RE = severity*response-efficacy, PTATR = positive thoughts about the recommendation, HK = health knowledge, $_1$ = multiple measures of past behaviour, * = p < .05, ** = p <.01, *** = p <.005, **** = p < .001.

Avoid foods high in fat. Perceived controllability ($F(1,207) = 116.13$, $p < .001$), past intake of foods high in fat ($\Delta F(1,206) = 21.08$, $p < .001$) and descriptive norms ($\Delta F(1,205) = 21.05$, $p < .001$) each contributed unique variance to a model of self-efficacy. Both positive thoughts about the recommendation ($\Delta F(1,204) = .67$, $p = .41$) and health knowledge ($\Delta F(1,202) = .82$, $p = .44$) did not contribute significant unique variance to the model. The final model explained 46.34% of the variance in self-efficacy ($F(6,202) = 29.98$, $p < .001$) a large effect size ($f^2 = .86$).

Avoid fast food. Hierarchical regression analysis revealed a significant model which explained 55.91% of the variance in self-efficacy ($F(6,202) = 44.96$, $p < .001$, $f^2 = 1.27$). Perceived controllability was found to explain 45.83% ($F(1,207) = 176.96$, $p < .001$), past intake of fast food explained a further 9.45% ($\Delta F(1,206) = 44.73$, $p < .001$) and descriptive norms explained a further 0.94% ($\Delta F(1,205) = 5.44$, $p < .05$). Positive thoughts about the recommendation ($\Delta F(1,204) = .02$, $p = .89$), and threat and efficacy health knowledge ($\Delta F(2,202) = .77$, $p = .47$) were each non-significant predictors.

Avoid soft drink. Perceived controllability was found to explain 49.34% of the variance in self-efficacy ($F(1,207) = 203.56$, $p < .001$). Past intake of soft drink explained a further 4.05% ($\Delta F(1,206) = 19.00$, $p < .001$). Descriptive norms were not found to explain any further unique variance ($\Delta F(1,205) = 2.57$, $p = .11$). Positive thoughts about the recommendations explained a further 0.66% ($\Delta F(1,204) = 3.96$, $p < .05$). Health knowledge did not contribute significant unique variance to the model ($\Delta F(2,202) = .76$, $p = .47$). The full model explained 54.29% of the variance in self-efficacy ($F(6,202) = 42.18$, $p < .001$, $f^2 = 1.19$).

Avoid foods high in sugar. Perceived controllability explained 34.19% of the variance in self-efficacy ($F(1,207) = 109.06$, $p < .001$). Past intake of foods high in sugar ($\Delta F(1,206) = 3.09$, $p = .08$), descriptive norms ($\Delta F(1,205) = .88$, $p = .35$), the defensive message processing responses variables ($\Delta F(1,204) = 2.48$, $p = .12$) and threat and efficacy health knowledge ($\Delta F(2,202) = .77$, $p = .46$) each did not contribute significant variance to the model. The final model explained 35.13% of the variance in self-efficacy ($F(6,202) = 19.77$, $p < .001$) a large effect size ($f^2 = .54$).

Predictors of maladaptive responses.

It was predicted that maladaptive responses (i.e., reactance and defensive avoidance) will be determined by high levels of fear, susceptibility, severity and minimising thoughts; and low levels of response-efficacy, self-efficacy and positive thoughts about the recommendation. Hierarchical regression analyses were utilised to test these predictions. Separate sets of analyses were performed for cognitive avoidance, behavioural avoidance and reactance. Analyses were structured identically for each of these outcomes. As separate measures of self- and response-efficacy were utilised for each of the health behaviours investigated separate analyses were conducted for each of these health behaviours. Block 1 contained susceptibility, severity, self- and response-efficacy. Block 2 contained interaction terms: susceptibility*self-efficacy, severity*self-efficacy, susceptibility*response-efficacy and severity*response-efficacy. Block 3 contained fear and block 4 contained the defensive message processing variables (i.e., minimising thoughts and positive thoughts concerning the recommendations; see table 7.11). To avoid high multicollinearity between the individual terms and the interaction terms susceptibility, severity, self- and response-efficacy were standardised prior to analysis (cf. Aiken & West, 1991; Dawson, 2013).

Hierarchical regression analyses investigating the predictors of cognitive avoidance.

*Exercise 30 mins***.** Hierarchical regression revealed a significant model which explained 14.46% of the variance in cognitive avoidance ($F(11,198) = 5.49$, $p < .001$, f^2

= .17; see table 7.11). Susceptibility, severity and self- and response-efficacy together explained 9.32% of the variance ($F(4,205) = 6.37$, $p < .001$). However, only severity emerged as a significant predictor, registering a negative β-value. Both the interaction terms ($\Delta F(4,201) = 1.53$, $p = .20$) and fear ($\Delta F(1,200) = 3.33$, $p = .07$) each did not contribute a significant proportion of unique variance to the model. The defensive message processing variables explained a further 3.19% of the variance in cognitive avoidance ($\Delta F(2,198) = 4.72$, $p < .01$). However, only positive thoughts about the recommendation was a significant predictor, registering a negative β-value.

Healthy Diet. Susceptibility, severity, self- and response-efficacy were found to explain 8.95% of the variance in cognitive avoidance ($F(4,205) = 6.13$, $p < .001$). The interaction terms were all non-significant predictors ($\Delta F(4,201) = .59$, $p = .67$). Fear was found to explain a further 1.42% ($\Delta F(1,200) = 4.18$, $p < .05$) and the defensive message processing variables in turn explained a further 2.97% of the variance ($\Delta F(2,198) = 4.39$, $p < .05$). However, only positive thoughts about the recommendation were a significant predictor, registering a negative β-value. Following the addition of the defensive message processing variables to the model the effect of fear on cognitive avoidance was attenuated to non-significance. The final model explained 12.61% of the variance in cognitive avoidance ($F(11,198) = 3.74$, $p < .001$) a small-medium effect size ($f^2 = .14$).

Avoid foods high in fat. Hierarchical regression analysis revealed that severity was a significant predictor of cognitive avoidance ($F(4,205) = 6.21$, $p < .001$), registering a negative β-value. The unique effect of susceptibility, self- and response-efficacy was non-significant. The interaction terms together did not contribute unique variance to the model ($\Delta F(4,201) = 1.65$, $p = .16$), however the severity*response-efficacy interaction emerged as a significant predictor ($\beta = -.18$, $p < .05$). Fear did not contribute significant unique variance to the model ($\Delta F(1,200) = 2.89$, $p = .09$). The defensive message processing variables explained a further unique variance ($\Delta F(2,198) = 4.00$, $p < .05$). However, only positive thoughts about the recommendation emerged as a significant predictor. The final model explained 13.63% of the variance in cognitive avoidance ($F(11,198) = 3.99$, $p < .01$, $f^2 = .16$).

To explore the moderating effect of response-efficacy on severity, interaction analyses were conducted using the regression equation obtained from blocks 1 and 2. Following recommendations from Aiken et al. (1991; see also Dawson, 2013) the relationship between severity and cognitive avoidance was examined under conditions where response-efficacy was low (-1 *SD*) and high (+1 *SD*). As can be seen in figure 7.9 when response-efficacy is high the negative relationship between severity and cognitive avoidance is stronger than when response-efficacy is low. However, simple slope analysis revealed that the slope remained significant regardless of whether response-efficacy was low (gradient = -.36, $t = -2.41$, $p < .05$) or high (gradient = -.91, $t = -4.42$, $p < .001$).

Avoid fast food. Hierarchical regression revealed a significant model which explained 17.65% of the variance in cognitive avoidance ($F(11,198) = 5.07$, $p < .001$, $f^2 = .21$). Susceptibility, severity, self- and response-efficacy together explained 9.91% of the variance ($F(4,205) = 6.75$, $p < .001$). However, only severity emerged as a significant predictor, registering a negative β-value. The interaction terms explained a further 5.39% ($\Delta F(4,201) = 4.26$, $p < .005$). Self-efficacy*susceptibility, self-efficacy*severity and response-efficacy*severity interaction terms all emerged as significant predictors. Both fear ($\Delta F(1,200) = 3.86$, $p = .051$) and the defensive message processing variables($\Delta F(2,198) = 2.41$, $p = .09$) did not explain a significant proportion of the remaining unique variance. Following the addition of the defensive message processing variables to the model the effect of the self-efficacy*severity interaction term was attenuated to non-significance.

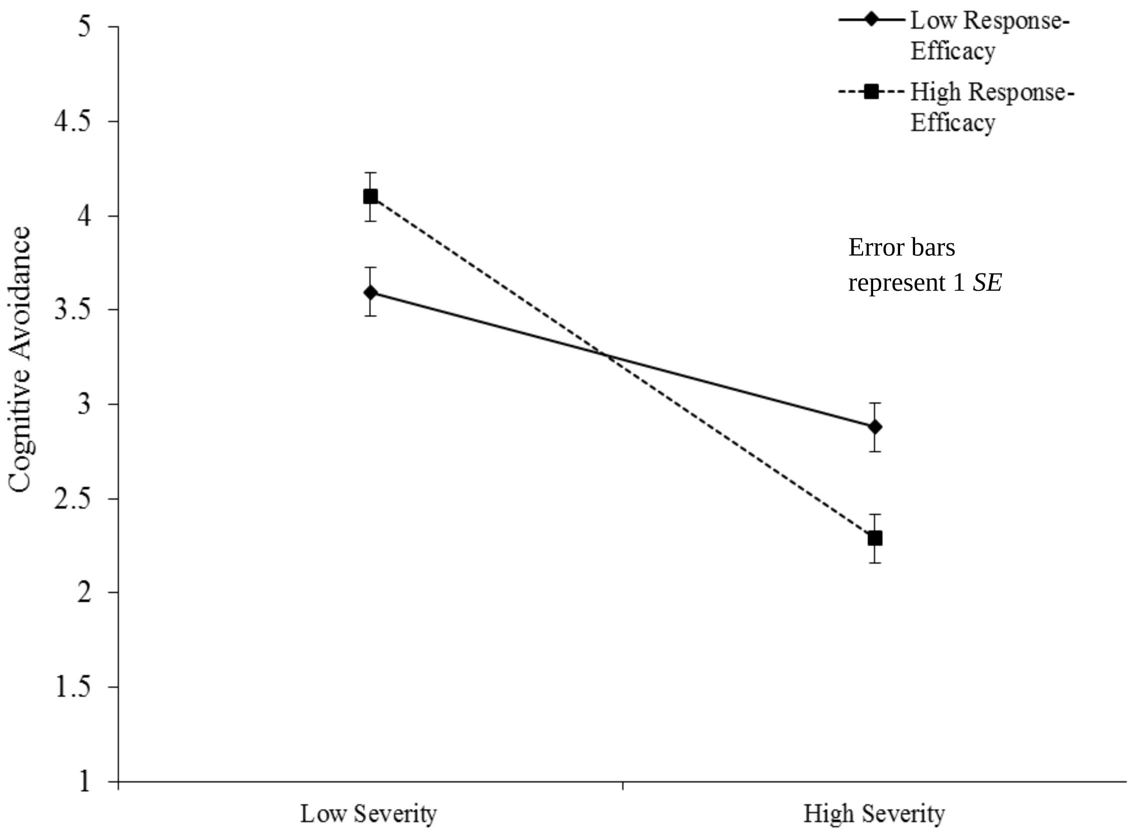

Figure 7.9. Cognitive avoidance as a function of perceived severity and response-efficacy (avoiding fatty foods).

To determine the nature of the susceptibility*self-efficacy interaction the relationship between susceptibility and cognitive avoidance was investigated under conditions of high and low self-efficacy (± 1 *SD*). As shown in figure 7.10, the strength of the relationship between susceptibility and cognitive avoidance is moderated by self-efficacy such that susceptibility is positively associated with cognitive avoidance when self-efficacy is low (gradient = .44, $t = 2.51$, $p < .05$), but is negatively associated when self-efficacy is high (gradient = -.31, t = -2.03, p < .05).

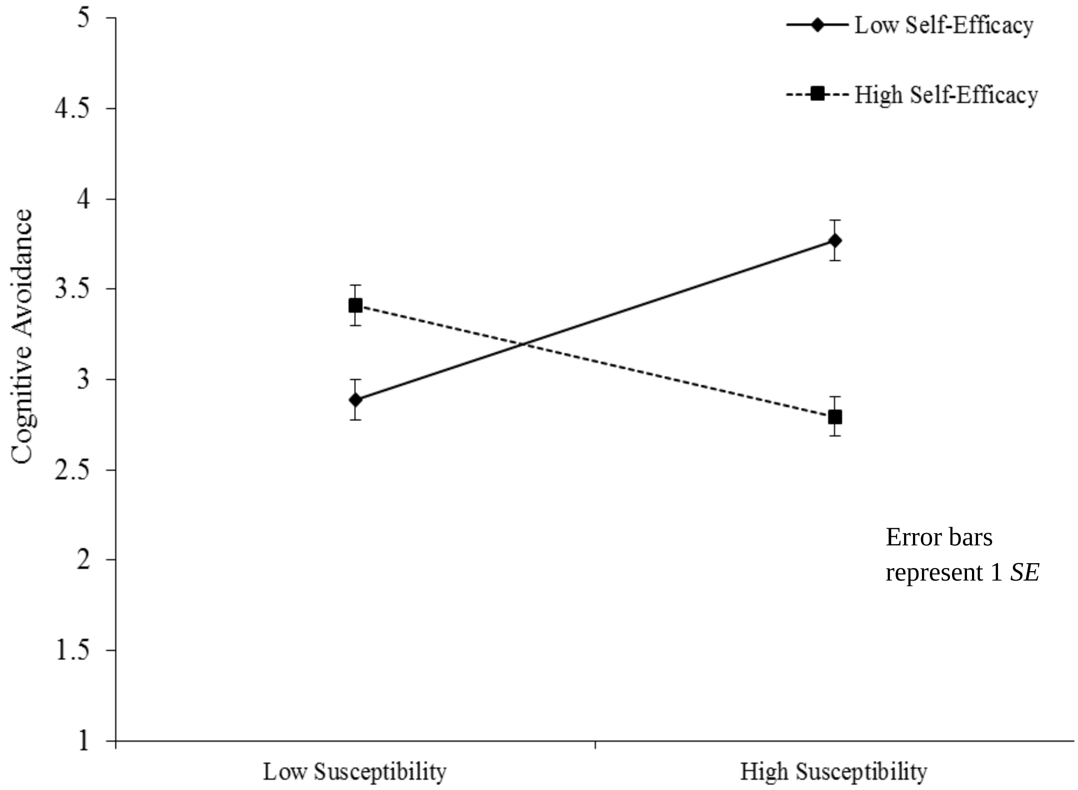

Figure 7.10. Cognitive avoidance as a function of perceived susceptibility and self-efficacy (avoiding fast food).

Similar analyses were conducted to investigate the severity*response-efficacy interaction. The relationship between severity and cognitive avoidance was investigated at high and low levels of response-efficacy. As can be observed in figure 7.11, severity is negatively associated with cognitive avoidance when response-efficacy is high only (gradient = -1.00, t = -5.45, p < .001). When perceived response-efficacy is low there is no significant association between severity and cognitive avoidance (gradient = -.05, t = -.28, p = .78).

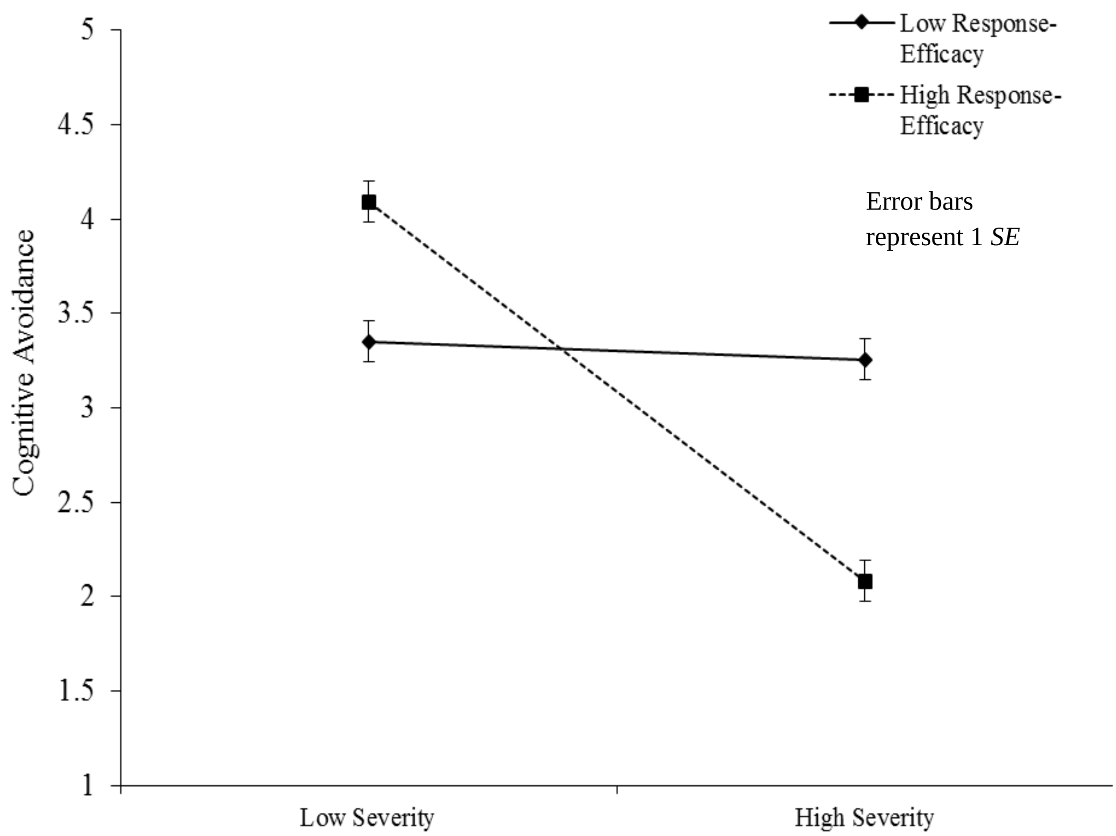

Figure 7.11. Cognitive avoidance as a function of perceived severity and response-efficacy (avoiding fast food).

Avoid soft drink. Susceptibility, severity, self- and response-efficacy were found to explain 9.16% of the variance in cognitive avoidance ($F(4,205) = 6.27$, $p < .001$). The interaction terms together did not contribute significant unique variance to the model ($\Delta F(4,201) = 1.48$, $p = .21$). However, the severity*response-efficacy interaction term emerged as a significant predictor. Fear was found to explain a further 1.44% ($\Delta F(1,200) = 4.26$, $p < .05$) and the defensive message processing variables in turn explained a further 2.14% of the variance ($\Delta F(2,198) = 3.48$, $p < .05$). However, only positive thoughts about the recommendation emerged as a significant predictor, registering a negative β-value. Following the addition of the defensive message processing variables to the model the effects of fear and the severity*response efficacy interaction term on cognitive avoidance were attenuated to non-significance. The final model explained 13.57% of the variance in cognitive avoidance ($F(11,198) = 3.98$, $p < .001$) a small-medium effect size ($f^2 = .16$).

The severity*response-efficacy interaction effect was further explored by comparing the effect of severity on cognitive avoidance at high and low levels of response-efficacy using the regression equation obtained from blocks 1 and 2. Simple slope analysis revealed that the effect of severity on cognitive avoidance was significant at high levels of response-efficacy (gradient = -.83, $t = -4.66$, $p < .001$), but was non-significant at low levels (gradient = -.22, $t = -1.13$, $p = .26$, see figure 7.12).

Avoid foods high in sugar. Hierarchical regression analysis revealed that severity was a significant predictor of cognitive avoidance ($F(4,205) = 6.37$, $p < .001$), registering a negative β-value. The unique effect of susceptibility self- and response-efficacy was non-significant. The interaction terms together did not contribute unique variance to the model ($\Delta F(4,201) = 1.53$, $p = .20$). Fear also did not contribute significant unique variance to the model ($\Delta F(1,200) = 3.34$, $p = .07$). The defensive message processing variables together explained a significant proportion of remaining variance ($\Delta F(2,198) = 4.72$, $p < .01$). However, only positive thoughts about the recommendation emerged as a significant predictor. The final model explained 14.46% of the variance in cognitive avoidance ($F(11,198) = 4.21$, $p < .001$, $f^2 = .17$).

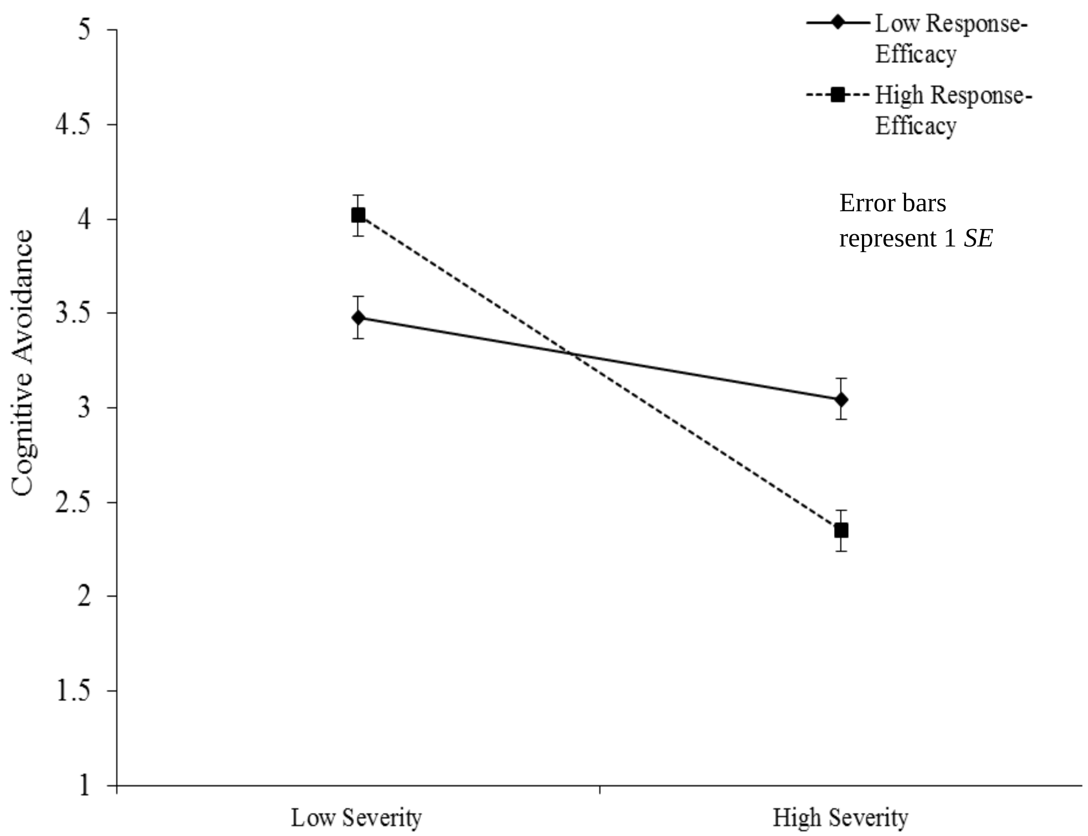

Figure 7.12. Cognitive avoidance as a function of perceived severity and response-efficacy (avoiding soft drink).

Hierarchical regression analyses investigating the predictors of behavioural avoidance.

Exercise 30 mins. Hierarchical regression revealed a significant model which explained 24.81% of the variance in behavioural avoidance ($F(11,198) = 7.27$, $p < .001$, $f^2 = .33$). Susceptibility, severity, self- and response-efficacy together explained 18.69% of the variance ($F(4,205) = 13.01$, $p < .001$). However, only severity and response-efficacy emerged as significant predictors, each registering a negative β-value. The interaction terms did not contribute significant variance to the model ($\Delta F(4,201) = .95$, $p = .44$). Fear was found to explain a further 2.21% ($\Delta F(1,200) = 6.63$, $p < .05$) and the defensive message processing responses variables explained a further 3.99% of the variance in behavioural avoidance ($\Delta F(2,198) = 6.29$, $p < .005$). However, only positive thoughts about the recommendation were a significant predictor, registering a negative β-value.

Healthy Diet. Susceptibility, severity, self- and response-efficacy were found to explain 20.51% of the variance in behavioural avoidance ($F(4,205) = 14.48$, $p < .001$). However, only severity and response-efficacy were found to be significant predictors, each negatively associated with behavioural avoidance. The interaction terms were all non-significant predictors ($\Delta F(4,201) = 1.30$, $p = .27$). Fear was found to explain a further 1.80% ($\Delta F(1,200) = 5.70$, $p < .05$) and the defensive message processing responses in turn explained a further 3.27% of the variance ($\Delta F(2,198) = 5.42$, $p < .01$). However, only positive thoughts about the recommendation were a significant predictor, registering a negative β-value. The final model explained 26.04% of the variance in behavioural avoidance ($F(11,198) = 7.9$, $p < .001$) a medium-large effect size ($f^2 = .35$).

Avoid foods high in fat. Hierarchical regression analysis revealed that severity self- and response-efficacy were each significant predictors of behavioural avoidance ($F(4,205) = 13.57$, $p < .001$), each registering a negative β-value. The interaction terms together did not contribute unique variance to the model ($\Delta F(4,201) = 1.42$, $p = .23$). However, the severity*self-efficacy interaction term emerged as a significant predictor. Both fear ($\Delta F(1,200) = 4.74$, $p < .05$) and the defensive message processing responses ($\Delta F(2,198) = 6.29$, $p < .005$) contributed to the model. However, minimising thoughts did not contribute significant unique variance. The final model explained 25.45% of the variance in behavioural avoidance ($F(11,198) = 7.49$, $p < .001$, $f^2 = .34$).

To determine the nature of the severity*self-efficacy interaction the relationship between severity and behavioural avoidance was investigated under conditions of high and low self-efficacy (± 1 *SD*). As shown in figure 7.13, the strength of the relationship between severity and behavioural avoidance is moderated by self-efficacy such that the negative association between severity and behavioural avoidance is significant when self-efficacy is high (gradient = -.52, $t = -3.90$, $p < .001$), but is non-significant when self-efficacy is low (gradient = -.10, $t = -.68$, $p = .50$).

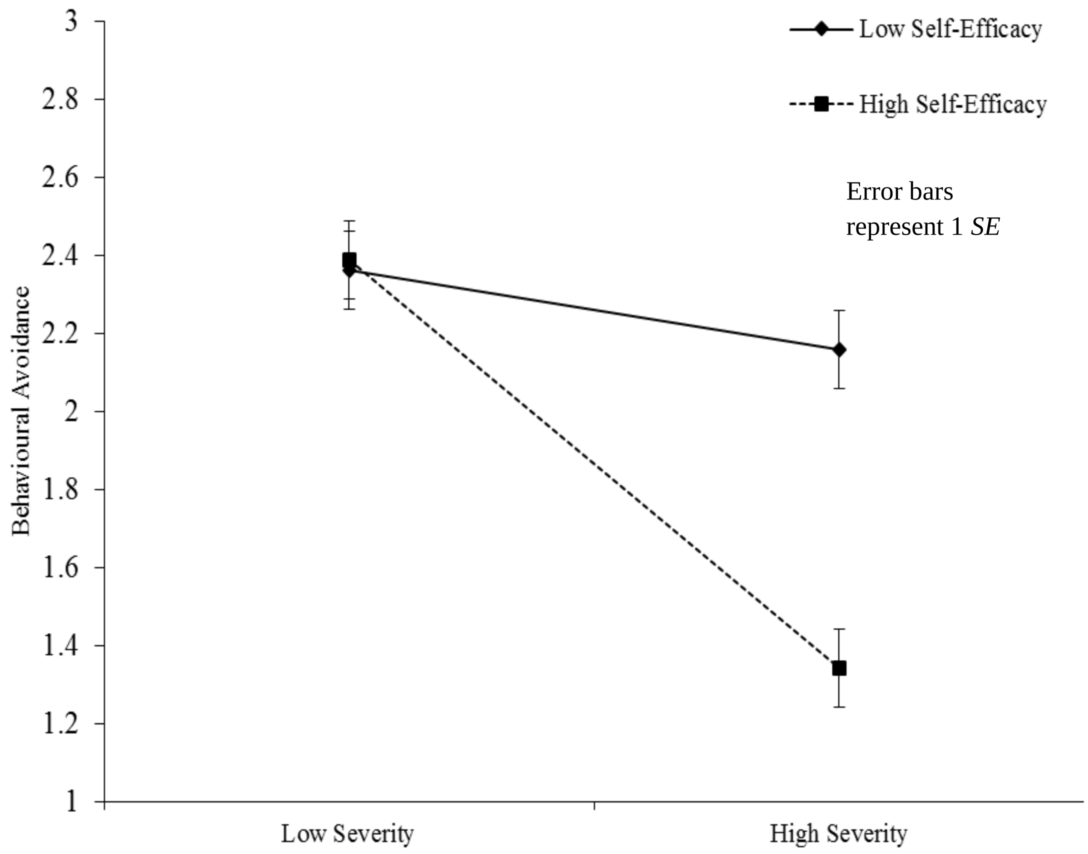

Figure 7.13. Behavioural avoidance as a function of severity and self-efficacy (avoid foods high in fat).

Avoid fast food. Hierarchical regression revealed a significant model which explained 25.94% of the variance in behavioural avoidance ($F(11,198) = 7.65$, $p < .001$,

$f^2 = .34$). Susceptibility, severity self- and response-efficacy together explained 21.77% of the variance ($F(4,205) = 15.45$, $p < .001$). However, only severity and self-efficacy emerged as significant predictors, both registering a negative β-value. The interaction terms did not contribute significant variance to the model ($\Delta F(4,201) = .46$, $p = .76$). Fear was found to explain a further 1.94% ($\Delta F(1,200) = 6.06$, $p < .05$) and the defensive message processing responses variables explained a further 3.06% of the variance in behavioural avoidance ($\Delta F(2,198) = 5.12$, $p < .01$). However, only positive thoughts about the recommendation were a significant predictor, registering a negative β-value.

Avoid soft drink. Susceptibility, severity, self- and response-efficacy were found to explain 18.56% of the variance in behavioural avoidance ($F(4,205) = 15.47$, $p < .001$). The interaction terms explained a further 3.71% ($\Delta F(4,201) = 3.48$, $p = .01$). However, only the self-efficacy*susceptibility and the response-efficacy*susceptibility interaction terms emerged as significant predictors. Fear explained a further 1.62% ($\Delta F(1,200) = 5.44$, $p < .05$) and the defensive message processing responses in turn explained a further 2.27% of the variance ($\Delta F(2,198) = 3.28$, $p < .05$). However, only positive thoughts about the recommendation were a significant predictor, registering a negative β-value. The final model explained 28.54% of the variance in behavioural avoidance ($F(11,198) = 8.59$, $p < .001$) a large effect size ($f^2 = .40$).

To determine the nature of the susceptibility*self-efficacy and susceptibility*response-efficacy interactions, the relationship between susceptibility and behavioural avoidance was investigated under conditions of high and low self-efficacy; and high and low response-efficacy. As shown in figure 7.14, the positive association between susceptibility and behavioural avoidance is significant when self-efficacy is high (gradient = .43, $t = 3.63$, $p < .001$). But when self-efficacy is low the effect of susceptibility on behavioural avoidance is non-significant (gradient = -.19, t = -1.42, p < .16).

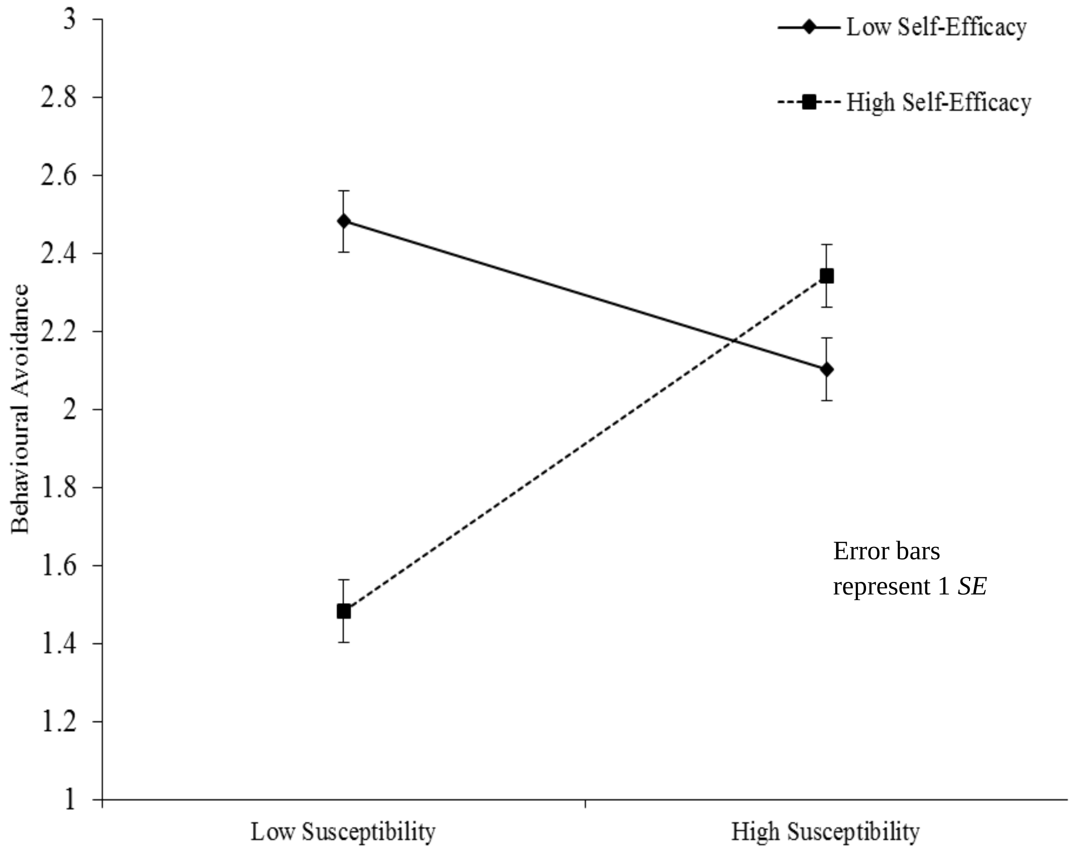

Figure 7.14. Behavioural avoidance as a function of perceived susceptibility and self-efficacy (avoid soft drink).

Similar analyses were conducted to investigate the susceptibility*response-efficacy interaction. The relationship between susceptibility and behavioural avoidance was investigated at high and low levels of response-efficacy. As can be observed in figure 7.15, susceptibility is positively associated with behavioural avoidance when response-efficacy is low (gradient = .38, t = 2.99, p < .005). When response-efficacy is high the relationship between susceptibility and behavioural avoidance is non-significant (gradient = -.14, t = -1.06, p < .29).

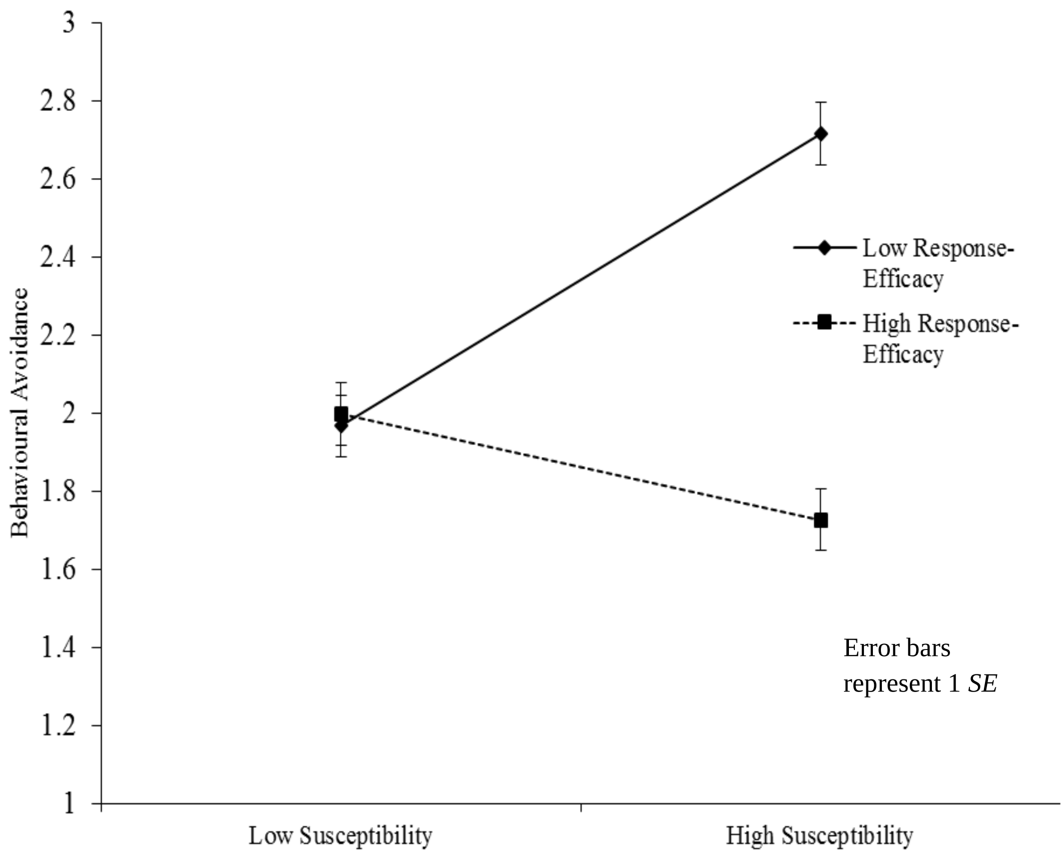

Figure 7.15. Behavioural avoidance as a function of perceived susceptibility and response-efficacy (avoid soft drink).

Avoid foods high in sugar. Hierarchical regression analysis revealed that severity and response-efficacy were each significant predictors of behavioural avoidance ($F(4,205) = 13.01$, $p < .001$), registering a negative β-value. The unique effect of susceptibility and self-efficacy were non-significant. The interaction terms together did not contribute unique variance to the model ($\Delta F(4,201) = .95$, $p = .44$). Both fear ($\Delta F(1,200) = 6.63$, $p < .05$) and the defensive message processing responses ($\Delta F(2,198) = 629$, $p < .005$) contributed unique variance to the model. However, minimising thoughts did not contribute significant unique variance. The final model explained 24.81% of the variance in behavioural avoidance ($F(11,198) = 7.27$, $p < .001$, $f^2 = .33$).

Hierarchical regression analyses investigating the predictors of reactance.

Exercise 30 mins. Hierarchical regression revealed a significant model which explained 15.10% of the variance in reactance (F(11,198) = 4.38, p < .001, f^2 = .18). Susceptibility, severity, self- and response-efficacy together explained 7.68% of the variance (F(4,205) = 5.35, p < .001). However, only severity and response-efficacy emerged as significant predictors, each registering a negative β-value. The interaction terms did not contribute significant variance to the model (ΔF(4,201) = 1.09, p = .36). Fear was found to explain a further 5.35% (ΔF(1,200) = 13.38, p < .001) and the defensive message processing responses variables explained a further 1.91% of the variance in reactance (ΔF(2,198) = 3.26, p < .05). However, neither of the cognitive response variables emerged as significant predictors in the full regression model.

Healthy diet. Susceptibility, severity, self- and response-efficacy were found to explain 9.26% of the variance in reactance (F(4,205) = 6.33, p < .001). However, only severity and response-efficacy emerged as significant predictors, both of which were negatively associated with reactance. The interaction terms were all non-significant predictors (ΔF(4,201) = .43, p = .79). Fear was found to explain a further 6.17% of the variance (ΔF(1,200) = 15.47, p < .001). The defensive message processing responses did not contribute significant unique variance to the model (ΔF(2,198) = 2.82, p = .06). The final model explained 15.94% of the variance in reactance (F(11,198) = 4.60, p < .001) a small-medium effect size (f^2 = .19).

Avoid foods high in fat. Hierarchical regression analysis revealed that severity and self-efficacy were significant predictors of reactance (F(4,205) = 6.12, p < .001), both registering a negative β-value. The unique effects of susceptibility and response-efficacy were non-significant. The interaction terms did not contribute unique variance to the model (ΔF(4,201) = 1.58, p = .18). Both fear (ΔF(1,200) = 13.37, p < .001) and defensive message responses ($\Delta F(2,198) = 3.10$, $p < .05$) contributed unique variance to the model. However, neither positive thoughts about the recommendation nor minimising thoughts contributed unique variance to the model. The final model explained 16.91% of the variance in reactance ($F(11,198) = 4.87$, $p < .001$, $f^2 = .20$).

Avoid fast food. Susceptibility, severity, self- and response-efficacy were found to explain 7.96% of the variance in reactance ($F(4,205) = 5.52$, $p < .001$). However, only severity emerged as a significant predictor, registering a negative β-value. The interaction terms were both non-significant predictors ($\Delta F(4,201) = .39$, $p = .82$). Fear was found to explain a further 6.13% of the variance ($\Delta F(1,200) = 15.15$, $p < .001$). The defensive message processing responses did not contribute significant unique variance to the model ($\Delta F(2,198) = 2.83$, $p = .06$). The final model explained 14.53% of the variance in reactance ($F(11,198) = 4.23$, $p < .001$) a small-medium effect size ($f^2 = .17$).

Avoid soft drink. Hierarchical regression revealed a significant model which explained 16.83% of the variance in reactance ($F(11,198) = 4.85$, $p < .001$, $f^2 = .20$). Susceptibility, severity, self- and response-efficacy together explained 9.70% of the variance ($F(4,205) = 6.61$, $p < .001$). However, only severity and self-efficacy emerged as significant predictors, each registering a negative β-value. The interaction terms did not contribute significant variance to the model ($\Delta F(4,201) = .85$, $p = .49$). Fear was found to explain a further 5.99% of the variance ($\Delta F(1,200) = 15.23$, $p < .001$). The defensive message processing variables did not contribute unique variance to the model ($\Delta F(2,201) = 2.69$, $p = .07$).

Avoid foods high in sugar. Hierarchical regression analysis revealed that both severity and response-efficacy were significant predictors of reactance ($F(4,205) = 7.07$, $p < .001$), registering a negative β-value. The unique effects of self-efficacy and susceptibility were non-significant. The interaction terms did not contribute unique variance to the model ($\Delta F(4,201) = .64$, $p = .63$). Both fear ($\Delta F(1,200) = 13.37$, $p < .001$) and the defensive message processing variables contributed further unique variance to the model ($\Delta F(2,198) = 3.44$, $p < .05$). However, positive thoughts about the recommendation did not contribute unique variance. The final model explained 17.03% of the variance in reactance ($F(11,198) = 4.90$, $p < .001$, $f^2 = .21$).

Hierarchical regression analyses investigating the predictors of attitudes. The EIM predicted that attitudes concerning health protective behaviour will be predicted by high levels of susceptibility, severity, response efficacy, self-efficacy and positive thoughts about the recommendation; and low levels of minimising thoughts and maladaptive responses (see figure 7.1). Hierarchical regression analyses were utilised to investigate these predictions. Separate analyses were performed for each of the health behaviours investigated. Variables were entered into the regression equation in four separate blocks. Block 1 contained susceptibility, severity, response-efficacy and self-efficacy; block 2 contained interaction terms (i.e., susceptibility*response-efficacy, severity*response-efficacy, susceptibility*self-efficacy and severity*self-efficacy); block 3 contained the cognitive response variables (minimising thoughts and positive thoughts about the recommendation; and block 4 contained each of the maladaptive (fear control; cf. Witte, 1992a) responses (i.e., cognitive avoidance, behavioural avoidance and reactance.

Exercise 30 Mins. Hierarchical regression revealed a significant model which explained 29.44% of the variance in attitudes concerning exercising for 30 minutes per day five days per week ($F(13,194) = 7.64$, $p < .001$, $f^2 = .42$). Susceptibility, severity response- and self-efficacy together explained 30.26% of the variance ($F(4,203) = 16.75$, $p < .001$). However, only response- and self-efficacy emerged as a significant predictors. The interaction terms ($\Delta F(4,199) = .49$, $p = .74$), the defensive message processing responses variables ($\Delta F(2,197) = 1.23$, $p = .30$) and the maladaptive fear control responses ($\Delta F(3,194) = .74$, $p = .53$) each did not contribute significant variance to the model.

Healthy Diet. Susceptibility, severity, response- and self-efficacy were found to explain 28.35% of the variance in attitudes concerning maintaining a healthy diet ($F(4,203) = 27.30$, $p < .001$). However, only response-efficacy was a significant predictor. The interaction terms were each non-significant predictors ($\Delta F(4,199) = .85$, $p = .49$). The defensive message processing responses ($\Delta F(2,197) = .77$, $p = .46$) and the maladaptive responses ($\Delta F(3,194) = .35$, $p < .78$) were also non-significant predictors of attitudes. The final model explained 27.25% of the variance in attitudes ($F(13,194) = 6.97$, $p < .001$) a medium-large effect size ($f^2 = .37$).

Avoid foods high in fat. Hierarchical regression analysis revealed that both response- and self-efficacy were a significant predictors of attitudes concerning avoiding foods high in fat ($F(4,203) = 12.98$, $p < .001$). The unique effects of susceptibility and severity were non-significant. The interaction terms together did not contribute unique variance to the model ($\Delta F(4,199) = 1.29$, $p = .28$). However, the severity*response-efficacy interaction term emerged as a significant predictor of attitudes. The defensive message processing response variables did not contribute significant variance to the model ($\Delta F(2,197) = .11$, $p = .90$). The addition of the maladaptive responses significantly increased the predictive power of the regression model ($\Delta F(3,196) = 5.93$, $p < .001$). However, behavioural avoidance was the only significant predictor, registering a negative β-value. The final model explained 24.22% of the variance in attitudes ($F(13,194) = 6.09$, $p < .001$, $f^2 = .32$).

In order to explore the moderating effect of response-efficacy on severity the relationship between severity and attitudes was examined under conditions where response-efficacy was low (-1 *SD*) and high (+1 *SD*). As shown in figure 7.16, the relationship between severity and attitudes was significant only under conditions of high response-efficacy (gradient = .24, $t = 2.39$, $p < .05$), under conditions of low response-efficacy the effect of severity on attitudes was non-significant (gradient = -.04, $t = -.53$, $p = .60$).

Avoid fast food. Hierarchical regression revealed a significant model which explained 23.24% of the variance in attitudes concerning avoiding fast food high in fat ($F(13,194) = 5.82$, $p < .001$, $f^2 = .30$). Susceptibility, severity, response- and self-efficacy together explained 20.96% of the variance ($F(4,203) = 14.72$, $p < .001$). However, only response- and self-efficacy emerged as significant predictors. The interaction terms ($\Delta F(4,199) = .49$, $p = .75$) and the defensive message processing responses variables ($\Delta F(2,197) = .75$, $p = .47$) each did not contribute significant variance to the model. The maladaptive responses explained a further 3.29% of the variance in attitudes ($\Delta F(3,194) = 3.81$, $p < .05$).

Avoid soft drink. Susceptibility, severity, response- and self-efficacy were found to explain 23.15% of the variance in attitudes concerning avoiding soft drink high in sugar ($F(4,203) = 16.59$, $p < .001$). The interaction terms were each non-significant predictors ($\Delta F(4,199) = .67$, $p = .61$). The defensive message processing responses ($\Delta F(2,197) = 1.39$, $p = .25$) and the maladaptive fear control responses ($\Delta F(3,194) = 2.09$, $p = .10$) did not explain a significant amount of additional variance in attitudes. However, behavioural avoidance was found to be a significant predictor of attitudes, registering a negative β-value. The final model explained 24.21% of the variance in attitudes ($F(13,194) = 6.09$, $p < .001$) a medium-large effect size ($f^2 = .32$).

Avoid foods high in sugar. Hierarchical regression analysis revealed that response-efficacy was a significant predictor of attitudes concerning avoiding foods high in sugar ($F(4,203) = 13.76$, $p < .001$). The unique effects of susceptibility, severity and self-efficacy were non-significant. The interaction terms ($\Delta F(4,199) = .45$, $p = .78$) and the defensive message processing variables ($\Delta F(2,197) = 1.48$, $p = .23$) each did not contribute significant variance to the model. However, the addition of the maladaptive responses significantly increased the predictive power of the regression model ($\Delta F(3,194) = 3.30$, $p < .05$). However, behavioural avoidance was the only significant predictor, registering a negative β-value. The final model explained 22.02% of the variance in attitudes ($F(10,197) = 7.10$, $p < .001$, $f^2 = .28$).

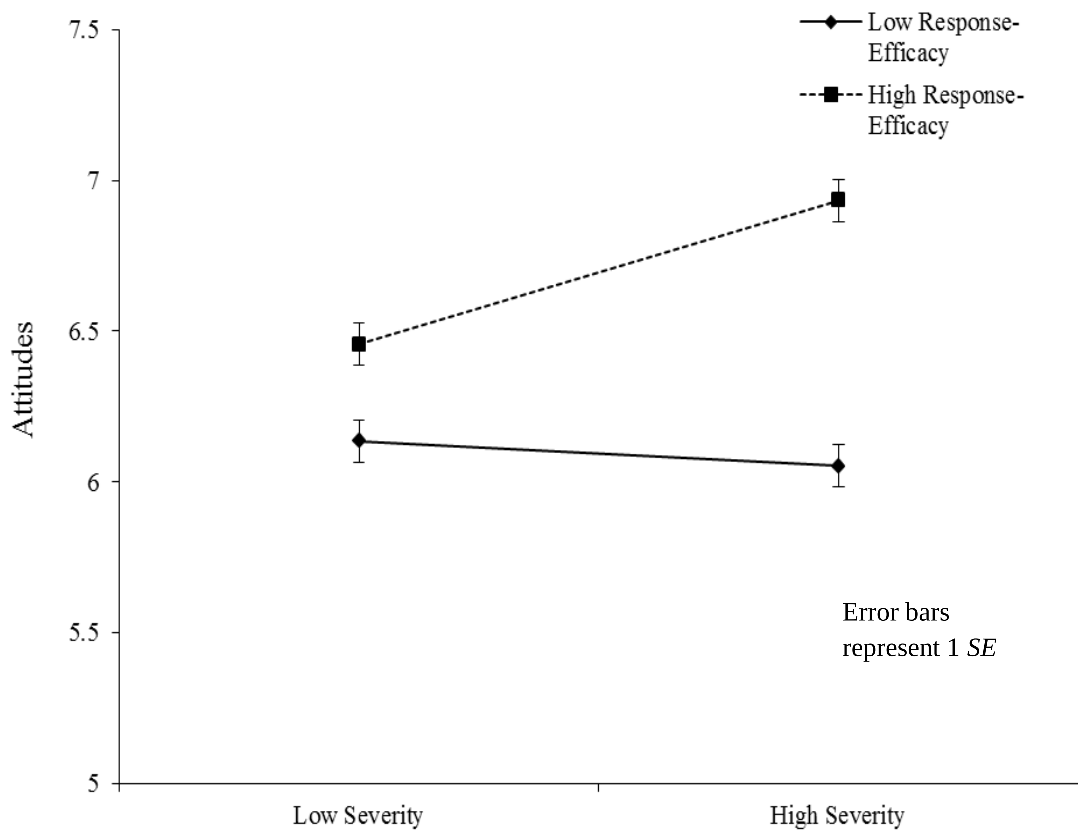

Figure 7.16. Attitudes concerning the avoidance of foods high in fat as a function of perceived response-efficacy and severity.

Predictors of intentions.

It was predicted that intentions will be determined by high levels of attitudes, injunctive and descriptive norms and self-efficacy; and low levels of maladaptive responses (see figure 7.1). Hierarchical regression was utilised to investigate these predictions. Separate regression equations were calculated for each of the six health behaviours investigated. Variables were entered into the regressions in four blocks. Block 1 consisted of attitudes and injunctive norms; block 2 consisted of self-efficacy; block 3 contained descriptive norms; and block 4 contained the fear control variables (i.e., cognitive avoidance, behavioural avoidance and reactance). Power to detect a medium effect size ($f^2 = .25$) exceeded .95 for all analyses.

Exercise 30 mins. Attitudes and injunctive norms together explained 19.78% of the variance in intentions to exercise 30 minutes per day five days per week ($F(2,206) = 26.64$, $p < .001$). Self-efficacy explained a further 37.25% ($\Delta F(1,205) = 179.58$, $p < .001$). Descriptive norms ($\Delta F(1,204) = 1.11$, $p = .29$) and the fear control variables ($\Delta F(3,201) = .41$, $p = .75$) did not contribute unique variance to the model. The final model explained 56.68% of the variance in intentions ($F(7,201) = 39.88$, $p < .001$) a large effect size ($f^2 = 1.31$).

Healthy diet. Hierarchical regression revealed a significant model which explained 52.00% of the variance in intentions to maintain a healthy diet ($F(7,201) = 33.19$, $p < .001$) a large effect size ($f^2 = 1.08$). Attitudes and injunctive norms together explained 27.60% ($F(2,206) = 40.66$, $p < .001$) and self-efficacy explained a further 22.38% ($\Delta F(1,205) = 93.17$, $p < .001$) of the variance in intentions. Descriptive norms did not emerge as a significant predictor ($\Delta F(1,204) = .03$, $p = .86$). The fear control variables together explained a further 2.25% of the variance in intentions ($\Delta F(3,201) =$

4.19, $p < .01$). However, none of the fear control variables emerged as significant predictors of intentions in the final model.

Avoid foods high in fat. Attitudes, injunctive norms ($F(2,206) = 30.74$, $p < .001$) and self-efficacy ($\Delta F(1,205) = 91.74$, $p < .001$) were each found to be significant predictors of intentions to avoid foods high in fat. Descriptive norms did not contribute significant unique variance to the model ($\Delta F(1,204) = .80$, $p = .37$). Behavioural avoidance added to the predictive power of the model ($\Delta F(3,201) = 3.29$, $p < .05$). Cognitive avoidance and reactance were non-significant predictors. The final model explained 47.75% of the variance in intentions ($F(7,201) = 28.15$, $p < .001$, $f^2 = .91$).

Avoid fast food. Attitudes and injunctive norms together explained 25.93% of the variance in intentions to avoid fast food high in fat ($F(2,206) = 37.40$, $p < .001$). Self-efficacy explained a further 29.42% ($\Delta F(1,205) = 136.72$, $p < .001$). Descriptive norms ($\Delta F(1,204) = .90$, $p = .34$) did not contribute unique variance to the model. The fear control variables explained a further 1.50% of the variance in intentions ($\Delta F(3,201) = 3.38$, $p < .05$). The final model explained 56.83% of the variance in intentions ($F(7,201) = 40.12$, $p < .001$) a large effect size ($f^2 = 1.32$).

Avoid soft drink. Hierarchical regression revealed a significant model which explained 45.28% of the variance in intentions to maintain a healthy diet ($F(7,201) = 33.19$, $p < .001$) a large effect size ($f^2 = .83$). Attitudes and injunctive norms together explained 20.42% ($F(2,206) = 27.69$, $p < .001$). However, only attitudes emerged as a significant predictor. Self-efficacy explained a further 23.39% ($\Delta F(1,205) = 86.75$, $p < .001$). Descriptive norms did not emerge as a significant predictor ($\Delta F(1,204) = .24$, $p = .62$). The fear control variables together explained a further 1.68% of the variance ($\Delta F(3,201) = 3.08$, $p < .05$). However, only behavioural avoidance emerged as a significant predictor of intentions.

Avoid foods high in sugar. Attitudes, injunctive norms ($F(2,206) = 15.62$, $p < .001$) and self-efficacy ($\Delta F(1,205) = 133.03$, $p < .001$) were each found to be significant predictors of intentions to avoid foods high in fat. Descriptive norms did not contribute significant unique variance to the model ($\Delta F(1,204) = 1.35$, $p = .25$). Behavioural avoidance added to the predictive power of the model ($\Delta F(3,201) = 4.36$, $p < .01$). Cognitive avoidance and reactance were non-significant predictors. The final model explained 49.17% of the variance in intentions ($F(7,201) = 28.15$, $p < .001$, $f^2 = .97$).

Predictors of behaviour.

It was predicted that health protective behaviour will be determined by greater intentions, high levels of self-efficacy and lower levels of maladaptive responses (see figure 7.1). Hierarchical regression analyses were utilised to investigate the predictors of health behaviour. Separate analyses were conducted for each of the health behaviours investigated. Variables were entered into the regression equation in three blocks. Block 1 contained intentions, Block 2 contained self-efficacy and block 3 contained past behaviour. A fourth block containing the fear control variables was entered in preliminary analyses but in all cases these variables were non-significant predictors of health behaviour and served to reduce the predictive power of the regression model. As such, analyses were re-run without this block. These findings suggest that contrary to predictions fear control responses do not disrupt the uptake of healthy behaviours.

Exercise Behaviour. Hierarchical regression analyses revealed a significant model which explained 26.67% of the variance in exercise behaviour (i.e., hours spent exercising per week; $F(6,58) = 8.15$, $p < .001$, $f^2 = .36$). Intentions to exercise 30 minutes per day five days per week explained 5.71% ($F(1,60) = 4.57$, $p < .05$) and self-efficacy explained a further 14.30% ($\Delta F(1,59) = 11.38$, $p < .005$). Past exercise behaviour explained a further 6.66% of the variance in current exercise behaviour ($\Delta F(1,55) = 6.17$, $p < .05$).

Intake of food high in fat. Intentions to avoid foods high in fat was not found to be associated with intake of food high in fat ($F(1,60) = 1.71$, $p = .20$). Self-efficacy explained a further 6.63% of the variance ($\Delta F(1,59) = 5.31$, $p < .05$). Past behaviour did not contribute significant unique variance to the model ($\Delta F(1,58) = 1.87$, $p < .18$). The final model explained 9.11% of the variance in intake of food high in fat ($F(3,58) = 3.04$, $p < .05$) a small effect size ($f^2 = .10$).

Fast food intake. Intentions to avoid fast food high in fat were found to be negatively associated with fast food intake ($F(1,60) = 6.00$, $p < .05$). Self-efficacy ($\Delta F(1,59) = 24.03$, $p < .05$) and past intake of fast food ($\Delta F(1,58) = 27.97$, $p < .05$) also contributed unique variance to the model. However, the effects of both intentions and self-efficacy on fast food intake were attenuated to non-significance following the addition of past behaviour to the model. The final model explained 54.68% of the variance in fast food intake ($F(3,58) = 25.13$, $p < .001$, $f^2 = 1.21$).

Soft drink intake. Hierarchical regression analyses revealed a significant model which explained 48.97% of the variance in soft drink intake ($F(6,58) = 8.15$, $p < .001$, $f^2 = .96$). Intentions to avoid soft drink were explained 15.80% ($F(1,60) = 12.45$, $p < .001$), and self-efficacy explained a further 14.48% ($\Delta F(1,59) = 13.46$, $p < .001$). Past intake of soft drink explained a further 18.69% of the variance in current soft drink intake ($\Delta F(1,58) = 22.60$, $p < .001$).

Intake of food high in sugar. Intentions to avoid foods high in sugar were negatively associated with intake of food high in sugar, explaining 10.26% of its variance ($F(1,60) = 7.98$, $p < .01$). Self-efficacy explained a further 17.77% of the variance ($\Delta F(1,59) = 15.81$, $p < .001$). Past behaviour did not contribute significant unique variance to the model ($\Delta F(1,58) = 3.65$, $p = .06$). The final model explained 31.12% of the variance in intake of food high in fat ($F(3,58) = 10.19$, $p < .001$) a large effect size ($f^2 = .45$).

Mediation Analyses

The mediational hypotheses of the EIM were investigated using hierarchical regression analyses and bootstrapped point estimates for the indirect effects (Baron et al. 1986; Preacher et al., 2004, 2008). The EIM predicted that the effects of severity, susceptibility, response-efficacy, minimising thoughts and positive thoughts about the recommendations on intentions would be mediated by attitudes; and the effects of perceived controllability, past behaviour, positive thoughts about the recommendations and threat and efficacy health knowledge on intentions would be mediated by self-efficacy (see figure 7.1). Further, intentions were predicted to mediate the effects of attitudes, injunctive and descriptive norms on health behaviour; and self-efficacy was predicted to mediate the effect of past behaviour on current health behaviour. Each of these relationships was investigated using hierarchical regression analyses. In all analyses the predictor variable was entered in the first step followed by the potential mediator variable in the second step. If the validity of the predictor variable is decreased in the second step, mediation is present. The Hayes et al. (in press) bootstrapping method was applied to test the significance of the indirect effects (5000 bootstrapped resamples). Recall that this method allows for multiple independent and mediator variables and the effects of other predictors can be controlled. As such, this analysis can be used to investigate whether a mediation (or suppression) effect still holds in the context of a full regression model; as opposed to just in the three variate case. A summary of all the mediation analyses is presented in table 7.12.

Mediating effect of attitudes.

Contrary to expectations attitudes did not mediate the effect of susceptibility on intentions. Further, attitudes only mediated the effect of severity on intentions for one health behaviour (avoid soft drinks high in sugar). In all other cases no significant mediation was present (see table 7.12). As predicted, attitudes were found to mediate the effect of response efficacy on intentions for all health behaviours investigated. However, in all cases (except for exercise intentions) only partial mediation was achieved. Contrary to predictions, attitudes did not mediate the effects of fear, minimising thoughts or positive thoughts about the recommendation on intentions.

Mediating effect of self-efficacy.

As predicted, self-efficacy mediated the effect of perceived behavioural control on intentions for all six health behaviours investigated. Self-efficacy also mediated the effect of: past exercise behaviour on exercise intentions; past fast food intake on intentions to maintain a healthy diet; past intake of foods high in fat on intentions to avoid foods high in fat (partial mediation); past intake of fast food on intentions to avoid fast food (partial mediation); and past consumption of soft drinks on intentions to avoid soft drinks high in sugar (partial mediation). Self-efficacy did not mediate the effect of threat or efficacy health knowledge or positive thoughts about the recommendation on intentions.

Self-efficacy was found to fully mediate the effect of perceived controllability on fast food intake and sugar intake. However, the effect of perceived controllability on exercise behaviour and soft drink intake changed from a weak negative effect to a stronger (but still weak) positive effect when self-efficacy was entered into the model. Investigation of the correlation matricies (see tables 7.5 and 7.9) revealed that perceived controllability registered a weak negative relationship with each health behaviour

Table 7.12

Mediation Relationships Predicted by the EIM with Accompanying Bootstrapped Point Estimates and Confidence Intervals

Health Behaviour	β_{yx}	$\beta_{yx.m}$	Bootstrapping[1] Point Estimate	*SE*	95% CI Lower	95% CI Upper
SUSC (*x*) → ATT (*m*) → INT (*y*)						
Exercise 30 mins	-.12	-.14*	.01	.03	-.04	.08
Healthy diet	-.01	.02	.01	.02	-.03	.04
Avoid fat	.001	-.02	.02	.02	-.002	.08
Fast food	-.04	-.07	.003	.03	-.05	.06
Soft drink	.04	.02	-.01	.02	-.06	.04
Avoid sugar	.002	-.01	-.001	.01	-.03	.03
SEV (*x*) → ATT (*m*) → INT (*y*)						
Exercise 30 mins	.10	-.01	.07	.05	-.02	.18
Healthy diet	.20***	.08	.03	.03	-.03	.11
Avoid fat	.26****	.16*	.01	.04	-.06	.09
Fast food	.23****	.11	.06	.05	-.05	.16
Soft drink	.18**	.06	.09†	.04	.02	.19
Avoid sugar	.14*	.06	.04	.03	-.01	.11
RE (*x*) → ATT (*m*) → INT (*y*)						
Exercise 30 mins	.25****	.08	.35†	.08	.20	.50
Healthy diet	.48****	.31****	.24†	.08	.11	.43
Avoid fat	.41****	.27****	.17†	.06	.07	.31
Fast food	.39****	.22****	.21†	.06	.10	.35
Soft drink	.44****	.31****	.14†	.05	.06	.24
Avoid sugar	.36****	.27****	.13†	.05	.05	.24
PC (*x*) → SE (*m*) → INT (*y*)						
Exercise 30 mins	.43****	.04	.44†	.07	.32	.58
Healthy Diet	.49****	.15*	.39†	.08	.25	.57
Avoid fat	.44****	.13	.30†	.06	.19	.45
Fast food	.54****	.15*	.39†	.08	.26	.57
Soft drink	.50****	.12	.34†	.08	.19	.50
Avoid sugar	.51****	.19***	.36†	.06	.26	.50

Table 7.12 continued

Health Behaviour	β_{yx}	$\beta_{yx.m}$	Bootstrapping[1] Point Estimate	SE	95% CI Lower	Upper
PB (x) → SE (m) → INT (y)						
Exercise 30 mins	.41****	.10	.21†	.03	.14	.28
Healthy diet[2]						
Fatty foods	-.17*	-.07	-.004	.02	-.05	.02
Fast food	-.29****	-.11	-.09†	.04	-.21	-.02
Soft drink	-.30****	-.18****	-.01	.01	-.03	.02
Sugary foods	-.22***	-.16***	.01	.01	-.03	.02
Avoid fat	-.38****	-.17***	-.04†	.01	-.07	-.02
Fast food	-.42****	-.12*	-.20†	.04	-.28	-.13
Soft drink	-.47****	-.25****	-.05†	.02	-.10	-.01
Avoid sugar	-.32****	-.19****	-.01	.03	-.08	-.001
Threat HK (x) → SE (m) → INT (y)						
Exercise 30 mins	.00	.06	-.13‡	.05	-.23	-.04
Healthy diet	.21***	.14*	-.004	.03	-.07	.06
Avoid fat	.20***	.12*	-.02	.03	-.08	.02
Fast food	.27****	.13*	-.02	.03	-.08	.02
Soft drink	.24****	.09	.02	.02	-.02	.07
Avoid sugar	.20***	.12*	-.04	.03	-.09	.02
Efficacy HK (x) → SE (m) → INT (y)						
Exercise 30 mins	.07	.09	.02	.02	-.02	.06
Healthy diet	.21***	.14*	-.002	.01	-.02	.02
Avoid fat	.13***	.07	.01	.01	-.01	.03
Fast food	.18****	.10**	.01	.01	-.01	.03
Soft drink	.18***	.07	-.003	.01	-.02	.01
Avoid sugar	.14***	.11*	.01	.01	-.01	.03
MT (x) → ATT (m) → INT (y)						
Exercise 30 mins	-.06	-.13*	.05‡	.03	.001	.13
Healthy diet	-.06	-.11	.02	.03	-.04	.07
Avoid fat	-.18**	-.16***	-.03	.04	-.11	.04
Fast food	-.09	.12*	.01	.04	-.07	.10
Soft drink	.03	.00	.01	.02	-.03	.06
Avoid sugar	-.09	.12	.02	.02	-.02	.07
PTATR (x) → ATT (m) → INT (y)						
Exercise 30 mins	.04	.00	-.02	.04	-.11	.04
Healthy diet	.12	.06	.004	.03	-.05	.06
Avoid fat	.08	.02	-.001	.03	-.06	.05
Fast food	.14*	.05	.04	.04	-.04	.12
Soft drink	.15*	.06	.04	.03	-.005	.11
Avoid sugar	.06	-.01	.03	.02	-.003	.09

Table 7.12 continued

Health Behaviour	β_{yx}	$\beta_{yx.m}$	Bootstrapping[1] Point Estimate	SE	95% CI Lower	Upper
IN (x) → INT (m) → CB (y)						
Exercise	-.02	-.14	.13	.11	-.01	.46
Fatty food intake	-.08	-.05	-.01	.08	-.25	.10
Fast food intake	.10	.26	-.09ǂ	.06	-.27	-.01
Soft drink intake	.08	.11	-.01	.06	-.18	.06
Sugary food intake	-.10	-.05	-.01	.08	-.30	.03
DN (x) → INT (m) → CB (y)						
Exercise	.01	-.04	.01	.16	-.08	.15
Fatty food intake	.03	.05	-.01	.08	-.22	.08
Fast food intake	.18	.23	.03	.04	-.01	.16
Soft drink intake	-.11	-.07	-.06	.12	-.38	.12
Sugary food intake	-.23	-.16	-.07	.08	-.30	.03
PC (x) → SE (m) → CB (y)						
Exercise	.03	-.24	.49ǂ	.19	.18	.94
Fatty food intake	-.17	-.02	-.52	.38	-1.53	.03
Fast food intake	-.30*	.00	-.34†	.17	-.73	-.09
Soft drink intake	-.16	.27	-1.35ǂ	.77	-3.40	-.37
Sugary food intake	-.23	.09	-.77†	.29	-1.48	-.33
PB (x) → SE (m) → CB (y)						
Exercise	.45****	.38***	.07	.06	-.02	.25
Fatty food intake	.30*	.23	.09	.11	-.07	.40
Fast food intake	.74****	.67****	.09†	.06	.005	.27
Soft drink intake	.71****	.65****	.10	.09	-.01	.35
Sugary food intake	.46****	.27*	.16†	.07	.06	.32

Note. x = predictor, m = mediator, y = outcome variable, β_{yx} = direct effect of predictor on intentions (standardised regression coefficient), $\beta_{yx.m}$ = direct effect of predictor on intentions after controlling for the mediator, SUSC = susceptibility, SEV = severity, ATT = attitudes, RE = response-efficacy, PC = perceived controllability, SE = self-efficacy, HK = health knowledge, INT = intentions, MT = minimising thoughts, PTATR = positive thoughts about the recommendation, CB = current behaviour, IN = injunctive norms, DN = descriptive norms. $_1$ = point estimate for the indirect effect and confidence intervals calculated using 5000 bootstrapped resamples, $_2$ = four separate measures of past behaviour used as predictors,* = $p < .05$, ** = $p < .01$, *** = $p < .005$, **** = $p < .001$, † = bootstrapped confidence interval does not contain zero, implying that decrease in magnitude of unstandardised regression coefficient of x as a result of m is different from zero (i.e., mediation). ǂ = bootstrapped confidence interval does not contain zero, implying that increase in magnitude of unstandardised regression coefficient of x as a result of m is different from zero (i.e., suppression).

in both cases; but was also registered strong positive associations with self-efficacy. This pattern of results indicates negative suppression – perceived controllability was strongly associated with the error in self-efficacy (Darmawan & Keeves, 2006; Pandey et al., 2010). This indicates that exercise behaviour and soft drink intake is uncorrelated with the shared variance between perceived controllability and self-efficacy. Further, self-efficacy partially mediated the effect of past fast food intake on current intake, and past intake of foods high in sugar on current intake.

Mediating effect of intentions.

Intentions were found to mediate the effect of attitudes on fast food intake only. Intentions did not mediate the effect of attitudes for any other health behaviours. Intentions also did not mediate the effect of injunctive or descriptive norms on health behaviour. However, the presence of intentions in a model regressing fast food intake on injunctive norms increased the predictive validity of injunctive norms. This pattern of results indicates suppression (Tzelgov et al., 1991). As injunctive norms were uncorrelated with fast food intake it is likely it acted as a suppressor variable within the regression equation increasing the predictive validity of intentions. Exploratory analyses confirmed this result the standardised regression coefficient for intentions (β = -.38) exceeded its bivariate association with fast food intake (r = -.30). These findings indicate that fast food intake was uncorrelated with the shared variance between intentions to avoid fast food and injunctive norms.

Discussion

The analyses described in the previous section were designed to test the predictions of the EIM (see figure 7.1 for a summary of these). The EIM was proposed as an attempt to integrate the predictions of the TPB, EPPM, RPA and Stage Model. A longitudinal study design was employed in order to test these predictions. Participants were assigned to one of four psychographic groups on the basis of their perceived threat (susceptibility and severity) and self-efficacy at baseline with respect to each of the six health behaviours investigated. Participants were also randomly assigned to view one of three threat messages, and one of two efficacy messages. The EIM made numerous predictions concerning how psychographic group, threat and efficacy message would impact on outcomes (e.g., susceptibility, severity, self-efficacy and response-efficacy). However, of the whole these predictions were not supported. The EIM also made several predictions concerning relationships between TPB, EPPM and Stage Model variables. Partial support was found for these predictions. A detailed explication of the results follows.

Effects of the Health Message and their Implications

Contrary to predictions the threat message did not lead to any change in perceived susceptibility or severity, and the efficacy message failed to change perceptions of response-efficacy from their baseline levels. Those who viewed the low efficacy message had lower self-efficacy to exercise at during the intervention phase when compared with baseline. However this was an isolated finding, self-efficacy concerning the adoption of healthy dietary behaviours (i.e., avoiding fatty foods, fast food, soft drink and foods high in sugar) was unchanged from baseline following the presentation of the health message. Therefore, overall the intensity of the threat message had no impact on perceptions of threat, and the intensity of the efficacy message had little impact on perceptions of efficacy. This suggests that the addition of vivid descriptive language and graphic imagery does little to increase perceptions of threat beyond the presentation of health information in a relatively benign manner. Further, individual perceptions of efficacy were unaffected by highlighting the effectiveness of good diet and exercise for maintaining good health and the ease with which these behaviours can be adopted. However, as predicted by the EIM (and EPPM; cf. Witte, 1992a), perceptions of fear increased with the intensity of the threat message, such that those viewing the high threat message reported the greatest fear. Therefore, these findings suggest that fear appeal messages fail to elicit change in cognitive appraisals of threat and efficacy, but they do cause increases in fear – an emotional response. Therefore on the whole, these results provided only limited support for the predictions of the EIM. These finding has implications for the use of fear appeals as a health promotion strategy.

According to contemporary fear appeal theory, the effectiveness of a fear appeal for eliciting changes in behaviour hinges on its target audience increasing their perceptions of threat and/or efficacy in response to the message (e.g., Das et al., 2003; de Hoog et al., 2005, 2007, 2008; Rogers, 1975, 1983; Witte, 1992a; Witte & Allen, 2000). In contrast, perceptions of fear are viewed as simply an inevitable by-product of a threat manipulation (e.g., Rogers, 1975), or as an outcome which is only indirectly associated (via threat perceptions) with health protective responses; but directly associated with maladaptive outcomes (i.e., defensive avoidance, reactance; Ruiter et al., 2003; Stephenson et al., 1998; Witte, 1992a, 1992b, 1994; Witte & Allen, 2000). As such, a health message which leads to increased fear but not increased perceptions of threat and efficacy is likely to be ineffective at producing protection motivation. Therefore, it is unsurprising that the threat and efficacy messages were each not associated with more positive attitudes or intentions to engage in regular exercise. Further, it is unsurprising that the high threat message (which lead to increased fear) elicited greater reactance and a greater number of minimising thoughts when compared with the moderate or low threat messages. Taken together these findings suggest that fear appeal messages are only successful in eliciting fear and defensive responding (cf. Ruiter et al.). As a result, participants' attitudes and health behaviour intentions remained unchanged in response to the health messages presented.

The findings of this study are inconsistent with findings from meta-analyses which suggest that threat and efficacy messages are generally associated with increases in perceptions of threat and efficacy, and more positive attitudes and intentions (e.g., Floyd et al., 2000; Milne et al., 2000; Witte & Allen, 2000). However, there are examples of experiments which have found that threat and efficacy messages fail to impact on threat and efficacy perceptions. Wong et al. (2009) found that television advertisements identified as high efficacy did not produce greater perceptions of efficacy than low efficacy advertisements. Goodall and Reed (2013) found that messages which depicted a certain health threat were perceived as no more threatening than ones that depicted an uncertain threat. These findings suggest that although the preponderance of evidence suggests that high threat and high efficacy messages are associated with increased perceptions of threat and efficacy respectively, these messages do not always have the expected effect.

An important difference between the present research and the preponderance of fear appeal research is that it adopted a longitudinal design and compared threat and efficacy perceptions before and after the presentation of the health message. Generally fear appeal research presents participants with a threat and/or efficacy message then investigates the difference in perceptions off threat between those who viewed a high and low threat message, and differences in perceptions of efficacy between those who viewed a high and low efficacy message (e.g., Carcioppolo et al., 2013; Cho, 2003; Goodall & Reed, 2013; Rogers & Mewborn, 1976; Stephenson et al., 1998; Witte, 1994). However, this method fails to directly investigate whether perceptions of threat and efficacy have changed significantly from where they were to before viewing the health message (cf. Weinstein, 2007). Even if those who view a high threat message have greater perceptions of threat than those who view a low threat message, it does not mean that those who viewed the high threat message changed their perceptions significantly relative to their baseline levels of threat. It may be that those who viewed the high threat message had a small increase in perceptions of threat, and those who viewed the low threat message experienced a small decrease. This pattern of results may result in a significant difference between the groups, but a non-significant difference between current threat perceptions, and perceptions before entering the experiment (which were not measured). Therefore, by not investigating prior perceptions of threat and efficacy, fear appeal experiments may have failed to identify that significant differences between high threat and low threat messages may actually represent quite small (and non-significant) absolute changes in threat perceptions as a result of the health message. Similar logic can be applied to efficacy messages. In support of this contention, Witte (1992b) found that those exposed to high threat messages did not differ in their perceptions of severity or susceptibility from a control group which viewed no health message. Similarly, those exposed to a high efficacy message did not differ in perceptions of self- or response-efficacy when compared with the control group. Further, no significant differences in attitudes or intentions were found between the experimental groups and the control.

Another possible reason for the threat and efficacy messages not leading to increases in perceptions of threat and efficacy within the present study is publication bias against null results. Peters et al. (2012) argued that fear appeal research may be susceptible to publication bias with researchers finding null results either not seeking publication or journal editors tending to reject sudies with null results. They further argued that positive results within the fear appeal literature would be most likely in study samples which are predominantly proactive. They argued that such participants are less likely to engage in defensive responses and have low baseline levels of threat which may be raised in response to a threatening message (unlike avoidant and responsive individuals). In the present study only around one-third of the sample were proactive. As such, the lack of effect of the threat and efficacy messages in the present study may not be as uncommon a finding as would be indicated by the published literature – as the true pattern of findings may be unknown due to publication bias in the literature.

The threat and efficacy messages also did not impact on health knowledge. Changes in threat and efficacy health knowledge over time were not moderated by threat or efficacy message condition. Interestingly no ceiling effects were found for the health knowledge measures. As such, participants could have gained health information from the health messages presented, but failed to do so. This suggests that participants did not fail to increase their knowledge because they already knew the information; rather they may have believed that they already knew this information and consequently paid limited attention to the message. In support of this interpretation a common response on the defensive message processing responses measure was “I already knew most of that stuff, so it wasn't much of a surprise to me” (participant #216) or variants on that theme. This suggests that participants may be dismissive of health messages targeting obesity as they believe that they already know enough about the subject.

It is unlikely that poor health message design is responsible for the failure of the messages to affect change in various outcomes from baseline. Both the threat and efficacy messages were developed in accordance with previous fear appeal research (e.g., Witte, 1992a, 1994) and followed guidelines for the development of fear appeal messages by Witte (1993; personal communication with author, 2011). Increasingly personalised language was utilised to manipulate perceptions of susceptibility; increasingly vivid descriptions of the negative health effects and increasingly graphic imagery were utilised to manipulate perceptions of severity; the effectiveness of diet and exercise and the ease with which these behaviours can be adopted were also manipulated to affect change in perceptions of response- and self-efficacy respectively (see table 7.1). Further, pilot tests suggested that individuals' believed that the high threat message was the most fear-provoking and threatening, and the high efficacy message suggested that diet and exercise was more helpful in managing weight than the low efficacy message. Finally, fear was found to increase with the intensity of the threat message, suggesting that as expected the high threat message was the most fear-provoking (cf. Witte, 1992a, 1992b). An alternative explanation may be that due to the increasing focus on health issues related obesity, diet and exercise recently (cf. Bonfiglioli, 2007), responsiveness to health messages targeting these behaviours has changed over time. That is, with increased exposure to health messages and fear appeal messages in particular, individuals may have become habituated to these messages such that they no longer have the desired effect.

The increasing rates of overweight/obesity have prompted significant interest in reducing the disease burden attributable to obesity (ABS, 2010, 2013). As a result, decreasing the rates of overweight/obesity has been an important target for health promotion in Australia in recent years (e.g., DoHA, 2010b; Miller et al., 2009). A precipitous increase in health promotion messages is evident when looking over the history of health promotion in Australia (AIHW, 2012). Numerous campaign messages have been applied since the 1970's but the proliferation of mass-media health promotion messages has increased in recent years. Australian government spending on health promotion activities is at an all-time high (AIHW, 2012; Preventative Health Taskforce, 2010). In addition to health promotion campaigns there has be a precipitous rise in recent years in media stories with weight loss, dieting and exercise as a focus

(Bonfiglioli, 2007). As a result, Australians are inundated with information regarding health problems associated with obesity and calls to eat healthier and engage in regular exercise. These messages may prompt many Australians to consider the relevance of weight-related health problems to them, and whether they can take effective actions to alleviate those threats (cf. Rogers, 1975, 1983; Witte, 1992). As a result, it is likely that many Australians have formed perceptions of threat and efficacy with regards to weight-related illnesses which may have been informed by the large amount of health information they are bombarded with on a daily basis.

With repeated presentations of the same (or similar) information individuals perceptions of threat and efficacy may be consolidated; such that they become less and less amenable to change with repeated presentations. Therefore, it is possible that that there may be a limit to possible effectiveness of health messages targeting a particular health issue within a population of interest. Initially, individual's perceptions of threat and efficacy may be determined by health messages in their environment (in addition to other sources of information, e.g., observation of others, information provided directly from medical professionals, prior experience engaging in protective behaviour; cf. Rogers, 1983), but continuing to bombard these individuals with more health information concerning the same health issue may be an exercise in diminishing returns. Intuitively, if an individual who is completely unaware that overweight/obesity is associated with increased health risks is presented with a fear appeal message their perceptions of threat and efficacy will undergo some significant change, perhaps leading to an associated change in attitudes, intention and behaviour. However, further fear appeals (or other health messages) targeting obesity should be associated with less and less change in perceptions, as they contain less and less new information for the individual. Following this logic, over time perceptions of threat and efficacy become less and less amenable to change in response to a health promotion message up till a point where further presentations of health promotion messages no longer have any effect on the individual at all. At this point further health information may be ignored or dismissed as “more of the same”. Some evidence supporting this contention was found in the present study with many participants indicating on the thoughts listing task that they were already aware of this information. Ironically, this suggests that health promotion messages may become less effective as the target population becomes more aware of the health issue.

In support of this interpretation, an Australian health promotion campaign targeting obesity (Measure up) was initially associated with modest increases in perceptions of susceptibility to weight-related illnesses, self-efficacy for losing weight, relevant health knowledge and some health behaviours (i.e., “measuring their waist”, “trying to lose weight” “trying to decrease their waist measurement”, DoHA, 2009, pp. 10). However, almost no significant changes in these outcomes were observed over the course of the campaign. No differences were found between April 2009 and May 2010 (while campaign messages were running) in the proportion of those reporting that they: increased the amount of exercise; increased fruit and vegetables consumption; tried to reduce their waist measurement; or measured their waist. Intentions to engage in these behaviours and many health knowledge outcomes also did not change over this period. Similarly, Halkjelsvik, Lund, Kraft and Rise (2013) found that a smoking campaign in an intellectual environment saturated by anti-smoking messages had no significant effect on participants’ smoking status, likelihood to quit or reduce smoking or cigarettes smoked per day. Additionally the intervention had minimal additional effect on individuals’ motivation to quit and perceived seriousness of the health effects of smoking. These findings suggest that repeated exposures to health messages targeting a single health issue may be associated with diminishing returns for many important health promotion outcomes. The target audience may develop an attitude of “I’ve seen it all before” and fail to respond as expected to the health promotion message. The present study supports these findings as no main effect of time was found for susceptibility, severity, and response-efficacy. Further although main effects of time were found for self-efficacy attitudes and behavioural intentions, these effects were inconsistent between health behaviours. These findings indicate that the health message had little or no effect on these outcomes in the present study.

Taken together these findings have implications for health promotion practice. They suggest that fear appeal messages targeting obesity, diet and exercise may be of limited usefulness as a health promotion strategy as they only succeed in increasing fear and defensive responses; failing to produce a corresponding change in threat and efficacy perceptions, attitudes, intentions or health knowledge. Overall these findings are inconsistent with the predictions of the EIM (and EPPM; Witte, 1992a). Importantly, these findings occur within a context – an intellectual environment saturated with calls to lose weight, eat healthier and engage in regular exercise. As such, it is unsurprising that another health message had little effect on participants’ perceptions of threat and efficacy and in turn their attitudes and intentions. This is a plausible explanation for why the health messages did not have the predicted effect on these outcomes. These findings suggest that health promotion messages may be of limited effectiveness for health issues which are relatively well known (or at least perceived to be so) within the target population. Further, fear based messages applied in such an intellectual environment may actually be counterproductive. The high threat message led to increases undesirable responses including fear, minimising thoughts and reactance when compared with less threatening messages. As such, other health promotion strategies should be applied as continued presentation of health messages becomes ineffective. It is important to note that this is not suggesting that health promotion messages have no role in promoting health. For health issues which are relatively unknown health messages may be an effective means of changing attitudes and behaviour. However, continuing to bombard individuals with information they are already aware of is not likely to increase their perceptions of threat and efficacy or change their attitudes and intentions.

Effects of Psychographic Group and their Implications

The EIM adopted predictions from the RPA that individuals can be separated into psychographic groups on the basis of their susceptibility and self-efficacy perceptions with respect to individual health behaviours (Rimal, 2001; Rimal et al., 2003). In the present study the largest proportion of individuals were assigned to the proactive group (low susceptibility, high self-efficacy) followed in turn by the indifferent group (low susceptibility, low self-efficacy), responsive (high susceptibility, high self-efficacy) and avoidant (high susceptibility, low self-efficacy) groups. According to the EIM these psychographic groups are predicted to differ in their attitudes towards the health behaviour, their intentions to adopt the health behaviour, their health knowledge and their past engagement in the health behaviour.

Responsive individuals.

In addition to having high perceived susceptibility and self-efficacy. The responsive group also reported: relatively strong intentions to engage in regular exercise and adopt healthy dietary habits; more positive attitudes; greater health knowledge; and reported relatively high weekly duration of exercise, and low rates of unhealthy dietary habits. Responsive individuals were also found to have high BMI. These findings suggest that responsive individuals are those who may be at risk of weight-related health problems but are committed to reducing their risk as evidenced by their past engagement in healthy behaviours, intentions to maintain these behaviours and high levels of relevant health knowledge.

Proactive individuals.

Similar to the responsive participants, proactive individuals had strong intentions to adopt healthy behaviours and positive attitudes concerning these behaviours. They also had relatively high health knowledge and were the most likely to adopt healthy dietary habits and had the highest weekly duration of exercise of the four groups. As expected, those in the proactive group also had lower BMI than those in the responsive or avoidant groups. These findings suggest that proactive individuals are relatively low risk of weight-related illness and are likely to remain low risk as they are committed to continuing to engage in healthy behaviours.

Avoidant individuals.

When compared with the responsive and proactive individuals, avoidant participants reported: lower intentions to maintain a healthy diet or engage in regular exercise; less positive attitudes concerning these behaviours; lower health knowledge; low duration of exercise in the past; and high past intake of unhealthy foods. The BMI for the avoidant group was comparable to that of the responsive groups. These findings suggest that avoidant individuals may be at risk of weight-related health problems. However, avoidant individuals appear less inclined to take action to reduce their health risk than their responsive counterparts. This is evidenced by lower intentions, less positive attitudes and suboptimal engagement in healthy behaviours relative to responsive individuals.

Indifferent individuals.

Similar to the avoidant participants, indifferent individuals were found to have relatively low intentions to maintain a healthy diet or engage in regular exercise and less positive attitudes concerning these behaviours when compared with their responsive or proactive counterparts. Further, these individuals also had relatively low health knowledge, and reported lower weekly exercise and higher intake of unhealthy foods. Indifferent individuals also had lower BMI when compared with those in the responsive and avoidant groups. These findings indicate that as a group indifferent individuals are less committed to adopting a healthy diet and engaging in regular exercise, they also have relatively poor knowledge concerning weight-related illnesses or reducing their risk.

Taken together the characteristics of each of the psychographic groups closely map onto the predictions of the RPA (cf. Rimal, 2000; Rimal et al., 2003) and the EIM. Responsive and proactive individuals were already engaging in greater weekly exercise and maintaining a healthier diet than avoidant and indifferent individuals. They were also more likely to intend to continue to adopt healthy diet and exercise. Indifferent individuals had the lowest health knowledge. This may be because indifferent individuals perceive information concerning weight-related illnesses and their prevention to be less relevant compared with the remaining three psychographic groups. These findings indicate that individuals' existing self-efficacy and (to a lesser extent) susceptibility are associated with numerous health protective outcomes.

Effect of Psychographic Groups on Threat Perceptions

Individuals in the indifferent group were found to increase their perceptions of both susceptibility and severity from baseline. Increases in perceived severity were also found for the proactive group. Proactive and indifferent individuals both had low perceptions of threat (susceptibility and severity; cf. Rogers, 1983; Witte, 1992a) at baseline; as such there was more room for these perceptions to increase in these individuals. In contrast, those in the responsive and avoidant groups already had high perceived susceptibility meaning that there was less room for it to increase in response to the health message. However, contrary to predictions increases in perceptions of threat were not moderated by the intensity of the threat message. This suggests that the presentation of a health message (regardless of its threat content) caused an increase in perceptions of threat only in those whose perceptions of threat were low at baseline. As such, the use of fear-provoking imagery and descriptions achieved nothing in terms of increasing perceptions of threat in these individuals – suggesting that such tactics may be ineffective and redundant. Taken together these findings suggest that health messages (regardless of the intensity of the threat message) may result in an increase in perceptions of threat in individuals whose existing perceptions of threat are low. However, once individuals' perceptions of threat are relatively high, health messages exert no additional effect.

Effect of Psychographic Groups on Efficacy Perceptions

Contrary to the predictions of the EIM, those in the proactive group reported a decrease in their perceptions of self-efficacy from baseline for each of the health behaviours investigated. Further, a similar reduction was found for the responsive group's perceptions of self-efficacy to exercise 30 minutes per day five days per week. Interestingly this effect was not moderated by efficacy message, suggesting that the content of the efficacy message had no impact. The EIM predicted that perceptions of both threat and efficacy would not change for the proactive groups as they are most likely to be engaging in health protective behaviour regularly. However, the findings of this study suggest that the presentation of the health message reduced perceptions of self-efficacy for the proactive group. This suggests that this group may have been overly optimistic with their perceptions of self-efficacy. The health message may have forced them to consider their competence more deeply. In doing so, the message may have highlighted or brought to mind difficulties with engaging in regular exercise and maintaining a healthy diet which would otherwise not have been attended to.

No differences were found from baseline for response-efficacy for all health behaviours. This suggests that the high efficacy message, which highlighted the effectiveness of healthy diet and exercise for reducing health risk, failed to change perceptions of response-efficacy from baseline. Importantly perceptions of response-efficacy were relatively high for all psychographic groups (all *M*s > 5.33/7) suggesting that generally participants accepted that healthy diet and exercise were important for maintaining health even before viewing the health messages.

Contrary to predictions, psychographic group was not found to interact with efficacy message to explain changes in self- and response-efficacy. Responsive individuals' perceptions of efficacy were not reduced following the presentation of a low efficacy message. It is possible that this lack of effect can be explained by their motivated reasoning. Although the low efficacy message suggested that healthy diet and exercise may be difficult to adopt, and that any gains achieved through adopting these behaviours may be slow, it is possible that individuals dismissed these misgivings as they were incompatible with their desire to make meaningful changes to their health behaviour (cf. Keller, 1999; Kunda, 1990). Alternatively this information may have provided a realistic outlook regarding their capacity for weight loss and as a result strengthened their resolve to continue to maintain a healthy diet and exercise despite slow results. Further contrary to predictions, no increases in efficacy perceptions were found for the avoidant and indifferent groups in response to the high efficacy message.

This suggests that the high efficacy message failed to increase perceptions of efficacy even in those with low perceived efficacy at baseline. Therefore, health messages alone may be insufficient to raise perceptions of efficacy in these individuals. More specifically targeted interventions may be necessary to address the individual needs of avoidant and indifferent individuals – raising their efficacy perceptions with respect to maintaining a healthy diet and engaging in regular exercise in the process.

Effect of Psychographic Groups on Attitudes and Intentions

The EIM predicted that responsive individuals would have more positive attitudes and stronger intentions when exposed to a high efficacy message; the proactive groups attitudes and intentions were predicted to be unaffected by the threat and efficacy messages; the avoidant group were predicted to respond best to a low threat high efficacy message; and the indifferent group were expected to respond to a high threat high efficacy message. Overall the results of the present study failed to support these predictions.

Very few changes over time were found for attitudes and intentions. Attitudes concerning exercising 30 minutes per day five days per week and intentions to exercise and intentions to maintain a healthy diet increased between the baseline and intervention phases. However, no differences in attitudes or intentions to avoid foods high in fat, fast food, soft drink or foods high in sugar were found. Contrary to predictions, changes in attitudes and intentions over time were not moderated by individuals psychographic or health message characteristics. These findings suggest that message characteristics and the individuals' psychographic characteristics do not affect their responsiveness to a health message. The effect of the message was similar regardless of the message content or individuals' existing perceptions of threat and efficacy – and for most of the target behaviours, the message exerted no effect at all. However, in light of the lack of effect the message exerted on threat and efficacy perceptions these findings are unsurprising. Conventional wisdom concerning fear appeal responsiveness and fear appeal theory both suggest that fear appeal messages are only effective insofar as they raise perceptions of threat and efficacy (cf. Ruiter et al., 2001; Witte, 1992a; Witte & Allen, 2000). Therefore, if messages fail to raise perceptions of threat and efficacy, it is expected that they will fail to lead to more positive attitudes and stronger intentions to adopt health protective behaviours (e.g., de Hoog et al., 2005, 2007, 2008; Ruiter et al., 2001; Witte, 1992a; Witte & Allen, 2000).

Health promotion messages generally target those who are not already engaging in healthy behaviours, or who are engaging in healthy behaviours but at suboptimal levels. Therefore, in terms of the EIM (and RPA; Rimal, 2001; Rimal et al., 2003) the primary target audience for health promotion are likely to be avoidant and indifferent individuals – as these groups are least likely to be already engaging in health protective behaviour (Rimal et al., 2003; Rimal, Brown et al., 2009; Turner et al., 2006). Therefore, on the whole the health message failed to elicit meaningful change in attitudes or intentions in both the target and non-target population. This suggests that health messages targeting diet and exercise may have reached the pinnacle of their effectiveness in the Australian population – or at the very least that a single presentation of a health message failed to elicit change in attitudes and intentions for this population. Increased proliferation of health messages may fail to increase perceptions of threat and efficacy which in turn mean that attitudes and intentions will also remain unchanged.

Effect of Psychographic Groups on Health Knowledge and Fear

It was predicted that the avoidant group would be the only group to gain health knowledge over time. It was suggested that the responsive and proactive groups would already have high levels of health knowledge so would be less likely to gain health knowledge and the indifferent group would view the information as irrelevant and not attend to the message. These predictions were only partially supported. Efficacy health knowledge did not increase from baseline for any of the psychographic groups suggesting that individuals failed to gain knowledge about protective responses as a result of the health message. Threat health knowledge increased from baseline in the avoidant group only. However, contrary to predictions this effect was not moderated by threat or efficacy message condition. It was assumed that avoidant individuals' capacity to gain health knowledge would be constrained by their fear (cf. Turner et al., 2006, Study 2). Therefore, the EIM predicted that avoidant individuals would gain more health knowledge when presented with a low threat high efficacy message as such a message would be least likely to cause fear (cf. Witte, 1992a). Such an explanation does not fit with the findings of this study – especially considering that the avoidant group experienced the greatest fear in response to the health message. However, contrary to expectations, the effect of fear was not moderated by threat message intensity in the avoidant group. Taken together these results suggest that avoidant individuals experience more fear when presented with health information regardless of the intensity of that information. However, contrary to predictions and previous research (Turner et al., Study 2) fear did not constrain the avoidant individuals' capacity to gain information from the health messages. In fact, they were the only group who showed a significant increase in health knowledge between the baseline and intervention phases of the study.

Effect of Psychographic Groups on Defensive Message Processing and Maladaptive Responses

As predicted, individuals in the avoidant group produced a greater number of minimising thoughts when presented with a high threat message. The high threat message depicted the health effects of increased weight as very severe and highlighted that overweight/obese individuals are at increased risk. Avoidant individuals perceive themselves to be susceptible to weight-related health problems but believe that they cannot take protective action to reduce their risk. As such, they have a vested interest in holding the belief that the health risks associated with increased weight are less severe – or minimising the risk in their minds. Holding such beliefs serves to reduce their fear, and is consistent with their decision to not engage in health protective behaviour (cf. de Hoog et al., 2007; Keller, 1999; Kunda, 1990; Witte, 1992a). It is likely that avoidant individuals engaged in defensively biased message processing in an attempt to reach a preferred conclusion that they are not at increased risk of weight-related health problems. The Stage Model predicts that those with high perceived susceptibility (i.e., responsive and avoidant individuals) will engage in the greatest defensive processing of threatening health messages (cf. Das et al., 2003; de Hoog et al., 2005, 2007, 2008). Therefore, this finding lends some support to the predictions of the Stage Model. However, in contrast to the predictions of the Stage Model responsive individuals did not show increases in minimising thoughts in response to the high threat message. This finding suggests that among individuals who perceive themselves to be at risk, self-efficacy moderates the tendency to engage in defensive responding concerning the health threat. Those low in self-efficacy will tend to engage in greater defensive responding when compared with those high in self-efficacy. This finding is therefore more closely aligned with the predictions of the EPPM which suggests that those high in perceived threat but low in perceived efficacy will tend to engage in defensive responses (cf. Witte, 1992a).

Contrary to predictions the high efficacy message was not associated with greater positive thoughts about the recommendation and the responsive group did not have significantly greater positive thoughts in response to the high efficacy message.

The only significant effect found was that the avoidant group reported a significantly greater number of positive thoughts about the recommendation when compared with the indifferent group. This finding lends limited support to the predictions of the Stage Model which suggests that those high in susceptibility will tend to engage in greater defensive processing of health messages (de Hoog et al., 2005, 2007, 2008). Although generating positive thoughts about maintaining a healthy diet and engaging in regular exercise is adaptive, it is also a defensive response as it assists the individual to reach the preferred conclusion that they can take effective action to reduce their health risk. However, the support for the model is only limited as the effect of susceptibility on positive thoughts about the recommendation is inconsistent – i.e., the responsive group was not found to produce a greater number of positive thoughts when compared with the proactive and indifferent groups.

One explanation for the finding is that individuals in the avoidant group may have been unsuccessful in minimising the health risk through defensively biased processing. They then became motivated to accept the recommended responses and engaged in defensively biased processing of the efficacy message. This defensively biased processing lead to the generation of positive thoughts about the recommendation. They had a vested interest in convincing themselves that they could take effective action to reduce their risk as holding such a belief is reassuring. This explanation is consistent with the Stage Model (de Hoog et al., 2005, 2007, 2008). In contrast, those in the indifferent group perceive themselves to be at less risk – they had no vested interest in holding the belief that maintaining a healthy diet and engaging in regular exercise can reduce the risk of weight-related health problems. In fact, they may have been motivated to hold the opposite belief as it would be consistent with their choice to not engage in these behaviours (cf. Keller, 1999; Kunda, 1990).

The EIM predicted that those exposed to a high threat low efficacy message would engage in the greatest fear control responses (i.e., cognitive avoidance, behavioural avoidance and reactance). Further, it was predicted that this effect would be most pronounced in the avoidant group. These predictions were not supported. This suggests that avoidant individuals are not more likely to engage in fear control processes than other psychographic groups. As such, these findings fail to support the predictions of the EPPM, RPA and EIM (Witte, 1992a, Rimal et al., 2003). Contrary to predictions, the indifferent group was found to more likely to engage in cognitive and behavioural avoidance than the responsive group. Further, the proactive group was also found to have greater cognitive avoidance than the responsive group. These effects occurred at all levels of the threat and efficacy message. It is possible that the proactive and indifferent groups reported greater cognitive avoidance as they have relatively low perceptions of susceptibility so are not concerned about weight related health problems. Therefore, there is little benefit to them thinking about these health problems. Similarly indifferent individuals may not want to engage in health protective behaviour because they believe it to be unnecessary – they perceive themselves to be at little risk so adopt an attitude of indifference towards their engagement in the health behaviour.

Taken together these findings give limited support to the predictions of the EIM. Findings suggest that changes in perceptions of threat and efficacy and health knowledge all occurred as a function of individuals' psychographic group. Those low in threat (proactive and indifferent) at baseline reported a small increase in threat over time; and small decrease in self-efficacy was found in the proactive group only between the baseline and intervention phases, and increases in health knowledge were found in the avoidant group only. However, contrary to predictions these findings were not moderated by threat or efficacy message group. This suggests that these changes occurred as a result of simply viewing a health message regardless of its content. Therefore, resorting to fear tactics in health messages may be unnecessary to increase individuals' perceptions of threat and increase their health knowledge, as fear-provoking messages will increase at a similar rate with simple matter of fact information. Further, the high threat message was found to be associated with maladaptive responses such as fear, reactance and minimising thoughts. These responses were shown to be negatively associated with adaptive attitudes, intentions and behaviours. As such, the results of this study suggest that not only do fear based messages lead to no positive effect, they are associated with several maladaptive outcomes which reduce the chances of behaviour change.

Extended Integrated Model Predictors of Fear Appeal Outcomes

The EIM attempted to explain associations between constructs from the EPPM, TPB and Stage Model in order to explain several important fear appeal outcomes including self-efficacy, maladaptive responses (cognitive and behavioural avoidance, and reactance), attitudes, intentions and behaviour in a single model. Many of the predictions of the EIM were supported, highlighting new associations between constructs from these three models. Each of the outcomes will be discussed separately below followed by a discussion of the overarching implications of the findings.

Determinants of self-efficacy.

As expected, perceived controllability and past behaviour were found to be determinants of self-efficacy. This suggests that individuals are more likely to believe they will be successful in adopting diet and exercise behaviour if they have done so before (cf. Bandura, 1977a, 1982, 1998), and believe they have control over their adoption of this behaviour (cf. Rotter, 1966). Self-efficacy was also predicted by descriptive norms suggesting that individuals may tend to believe that a healthy diet and exercise behaviours are easier to adopt if their peers or important others have been able to adopt them, or they have observed others successfully engaging in these behaviours (Bandura, 1977a, 1982, 1998). These findings lend support to the predictions of the EIM and echo the findings of Studies 2 and 3.

Self-efficacy also mediated the effect of both perceived controllability and past behaviour on intentions. These findings are consistent with the results of Study 2 and Study 3 and suggest that self-efficacy results from individual's belief that they have control over their performance of a behaviour, and their past experience engaging in that behaviour (cf. Bandura, 1977a, 1982, 1998). The findings also lend further support to Ajzen's (2002b; see also Fishbein et al., 2010) contention that the effect of past behaviour on intentions should be mediated by other predictors of intentions. Self-efficacy was also found to mediate the effect of perceived controllability on fast food and high sugar food intake. This finding lends further evidence to the contention that of these two elements that constitute PBC within the TPB, self-efficacy has the greatest predictive validity for both intentions and behaviour (cf. Armitage et al., 1999a, 1999b; Hagger et al., 2002; Hagger et al., 2005; Povey et al., 2000a). Finally self-efficacy was found to partially mediate the effect of past behaviour on fast food and high sugar food intake. Although the predictive validity of past behaviour was reduced for the other health behaviours when self-efficacy was explored as a mediator, its effect was non-significant. These results lend some support to Ajzen's (2002b) argument that predictors of behaviour will mediate the effect of past behaviour on future behaviour. However, the effect was not consistent across all the health behaviours investigated, and the residual effect of past behaviour on current behaviour remained strong and significant. This suggests that other predictors of behaviour need to be explored in order to fully mediate the effect of past behaviour on current behaviour. Possible candidates for such predictors will be discussed in a later section.

Determinants of fear, defensive message processing and maladaptive responses.

Fear was found to be positively associated with susceptibility but not severity. These findings support previous research which suggests that perceptions of susceptibility and fear are positively correlated (de Hoog et al., 2007; Witte, 1994). Fear was also associated with reactance and behavioural avoidance (but not cognitive avoidance) suggesting that increases in fear are associated with maladaptive responses to fear appeal messages (cf. Witte, 1992; Witte & Allen, 2000). Minimising thoughts were found to be associated with susceptibility. This finding is consistent with the predictions of the Stage Model which suggests that those who believe they are susceptible to a health risk should engage in defensive message processing (Das et al., 2003; de Hoog et al., 2005, 2007). In a meta-analysis of the relevant research de Hoog et al. (2007) found that perceptions of susceptibility were positively associated with minimising thoughts. According to the Stage Model, individuals who are susceptible to a health risk have a vested interest in minimising this health risk as this supports their preferred conclusion that they are a healthy individual (de Hoog et al., 2005, 2007, 2008). Those who believed the health effects of increased weight were more severe generated fewer minimising responses. This finding is to be expected as it is intellectually inconsistent to state that the health effects of increased weight are severe and simultaneously generate responses minimising the severity of these health effects. As such, those high in severity naturally generated fewer minimising responses. Across the six health behaviours investigated, positive thoughts about the recommendation were found to be most consistently predicted by susceptibility and severity. These findings are consistent with the predictions of the Stage Model which suggest that individuals are most likely to engage in defensive message processing when threatened.

According to the EPPM fear control responses (i.e., cognitive avoidance, behavioural avoidance and reactance) are associated with fear; they may also occur when individuals are threatened and believe that they cannot take effective action to alleviate their health risk (Witte, 1992a; Witte & Allen, 2000). The EIM further predicts that minimising thoughts would be positively associated with fear control responses and positive thoughts about the recommendation would be negatively associated. The results of this study only partially support these predictions.

As predicted by the EIM, individuals were less likely to engage in cognitive avoidance when they generated more positive thoughts about the recommendation. This finding is entirely expected as these two factors represent opponent processes. Individuals who avoid thinking about weight related health problems are not likely to generate several positive thoughts about engaging in diet and exercise, as doing so may involve thinking about weight related illnesses. Those low in severity were found to engage in greater cognitive avoidance. Further, for two health behaviours (avoiding fast food and soft drink) this relationship was only significant when response-efficacy was high. It is possible that this finding is not due to a defensive response but is rather suggests that certain individuals are not concerned about weight related health problems and consequently do not feel the need to think about them. Low severity high response-efficacy individuals believe that the health effects of increased weight are not particularly severe and that even if they were they could engage in protective responses. It makes sense that such individuals may not feel the need to think about weight related health problems after reading a health message. Contrary to predictions, cognitive avoidance was not found to be associated with fear. Taken together these findings suggest that individual's tendency not to think about a weight related health problems may not be a defensive response in response to increased fear and threat, but a logical consequence of believing that the health threat depicted is less severe and can be easily managed.

Behavioural avoidance was found to be positively associated with susceptibility and negatively associated with severity, self- and response-efficacy and (contrary to predictions) fear. The positive association with susceptibility is consistent with the predictions of the Stage Model – that increased susceptibility is associated with increased defensive responding (de Hoog et al., 2005 2007, 2008). This is also consistent with other findings from this study (i.e., those pertaining to minimising thoughts and positive thoughts about the recommendation). The negative association between behavioural avoidance and severity may be explained similarly to the same association for cognitive avoidance – if the health effects are not perceived to be severe why would somebody want to engage in protective responses. Conversely if the health effects are believed to be severe individuals should be more likely to want to protect themselves from these health effects (i.e., low behavioural avoidance). Those low in self- and response-efficacy may tend to avoid engaging in protective responses simply because they believe that these responses will not be effective in reducing their health risk or believe that they would be unable to adopt them. Several findings have suggested that low perceived efficacy leads to defensive responses (e.g., Fruin et al., 1991; Rippetoe et al., 1987; Ruiter et al., 2003; Self et al., 1990; Witte & Allen, 2000).

Reactance was found to be positively associated with fear and negatively associated with severity and self- or response-efficacy. All three threat messages presented discussed the health effects associated with increased weight. Findings of the present study suggest that perceptions of severity were mostly unchanged as a result of the health message presented. As such, those who believed that the health effects of increased weight were less severe may have believed that the health messages were overstated in their presentation of the health risks and designed to manipulate them and as a result engaged in reactance. Conversely those who believed that the health effects were severe believed that the messages were more accurate representations and did not engage in reactance. Those low in perceived response-efficacy believe that protective responses are less effective in reducing the health threat. Therefore, they similarly may have believed that the message may have been manipulative, overstating the effectiveness of certain responses in reducing risk for weight related health problems. Further these individuals have a vested interest in discounting the threat messages presented as they believe they cannot take effective action to alleviate this threat.

Findings investigating the relationship between fear and fear control responses have been somewhat inconsistent. Although it is predicted that fear is positively associated with all fear control responses (cf. Witte, 1992a; e.g., Ruiter et al., 2003; Witte, 1994), negative associations have also been recorded (e.g., Abraham et al., 1994; Witte, 1994). On the whole, fear appears to be positively associated with reactance responses such as perceived manipulation and message derogation (Ruiter et al.; Witte, 1994). However, defensive avoidance responses such as avoiding thinking about about the risk and denial/minimisation of risk are negatively associated (e.g., Witte, 1994; Abraham et al.). These findings are consistent with the results of the present study where those who increased fear was associated with increased reactance but decreased behavioural avoidance. A possible explanation for this finding is that defensive avoidance responses involve ignoring or avoiding the message content which may naturally lead to reductions in fear (cf. Witte, 1994). This makes sense in terms of the predictions of the EPPM which suggests that fear control processes are implemented in order to reduce fear individuals experience about the health threat (Witte, 1992a; Witte & Allen, 2000). In contrast, reactance responses require the individual to think about the message in order to come to the conclusion that it is manipulative. However, this does not necessarily entail a rejection of the health risk. An individual may still accept that the health risk is real, but engage in reactance simply as a means of rebelling against the proponents of the threatening message who are perceived as being manipulative or threatening one's freedom. That is, they may accept the health threat and experience fear as a result (cf. Witte, 1992a), but believe that the message is exaggerating it as a means of increasing conformity. As such, defensive avoidance and reactance may serve different functions in response to the health message. The function of defensive avoidance is to reduce fear, whereas the function of reactance is to rebel against an authority who is perceived as threatening one's freedom (cf. Brehm, 1966; Brehm et al., 1981; Erceg-Hurn et al., 2011).

Threat*efficacy interaction effects were also found to predict maladaptive responses. On the whole these suggested that the threat (i.e., susceptibility or severity) was negatively associated with maladaptive responses when efficacy (i.e., self- or response-efficacy) was high, and was more weakly associated when efficacy was low (see figures 7.9-7.15). These findings are somewhat consistent with the predictions of the EPPM which suggests that maladaptive responses should occur when perceptions of threat are high and efficacy is low; and adaptive responses (attitudes, intentions and behaviour) prevail when threat and efficacy are high (Witte, 1992a). Although the results do not fully map onto these predictions, they at least suggest that maladaptive responses are less likely when both threat and efficacy are high – consistent with the EPPM.

Taken together these findings suggest that increasing perceptions of susceptibility and fear are often associated with increases in maladaptive defensive responses. These findings are consistent with fear appeal theory and suggest that threatened and fearful individuals tend to engage in defensive responses as a means of reducing their fear, ignoring the health threat or reaching a preferred conclusion that they are either not at risk or can take effective action to reduce their risk (cf. de Hoog et al., 2005, 2007, 2008; Witte, 1992a; Witte & Allen, 2000). As such, messages designed to elicit fear or perceptions of susceptibility may backfire, and should be used with caution (cf. Ruiter et al., 2003; Ruiter et al., 2005). In contrast, perceptions of severity were generally associated with decreases in maladaptive responding. The results of the study suggest that individuals with high perceived severity are concerned about the health effects of increased weight and as such do not try to minimise or avoid thinking about these. This suggests that perceptions of susceptibility and severity should be considered separately rather than as part of a unitary threat construct (as in the EPPM and PMT-R; cf. Rogers, 1983; Witte, 1992a, 1992b, 1994) – as they are associated with opposite responses to fear appeal messages. Consistent with previous research response-efficacy was found to be either not associated (cf. Witte, 1994) or negatively associated with measures of maladaptive responding (cf. Fruin et al., 1991; Rippetoe et al., 1987; Ruiter et al., 2003; Self et al., 1990; Witte & Allen, 2000). Therefore, as a whole these findings suggest that individuals are most likely to engage in defensive responding when they experience high levels of fear, believe themselves to be susceptible to a health problem and believe that they cannot take effective action to reduce their health risk.

Adaptive responses: Attitudes, intentions and behaviour.

As predicted, both response- and self-efficacy was found to be positively associated with attitudes – echoing the results of Studies 2 and 3. However, severity, susceptibility, minimising thoughts and positive thoughts about the recommendation exerted no unique effect on attitudes. Attitudes were found to mediate the effect of response-efficacy on intentions. This finding was consistent across all six of the health behaviours investigated – again echoing the results of Studies 2 and 3. These findings suggest that the belief that maintaining a healthy diet and engaging in regular exercise will be associated with decreased risk of developing weight-related health problems is an important and salient behavioural belief contributing to one's attitudes about these behaviours (cf. Ajzen, 1991). Further individuals are more likely to hold positive attitudes concerning healthy diet and exercise behaviour when they believe they will be able to successfully adopt these behaviours.

Attitudes were also found to be negatively associated with behavioural avoidance. This finding is consistent with previous research which suggests that maladaptive fear control process are negatively associated with adaptive responses (e.g., Rippetoe et al., 1987; Ruiter et al., 2003; Witte, 1992a, 1992b; Witte & Allen, 2000). Further, although the other fear control processes were not unique predictors of attitudes, negative bivariate correlations were recorded between these and attitudes for all health behaviours. Therefore, individuals are likely to hold positive attitudes with respect to a particular behaviour if they believe this behaviour will be effective in reducing a health risk, and they do not engage in defensive responses to a health message.

Consistent with the predictions of the EIM and TPB (Ajzen, 1991), attitudes, injunctive norms and self-efficacy were each found to be associated with intentions to exercise and maintain healthy dietary habits. Significant bivariate correlations were also found between descriptive norms and intentions. However, descriptive norms were not found to be a significant predictor of intentions within the context of the EIM for any of the health behaviours investigated. These findings run contrary to the results of previous studies which have found that descriptive norms add to the prediction of intentions after controlling for attitudes, injunctive norms and PBC (e.g., Conner & McMillan, 1999; McMillan & Conner, 2003a, 2003b; Rivis et al., 2003; Sheeren et al., 1999; White et al., 1994); but support findings which suggest that descriptive norms exerts no unique effect (e.g., Povey et al., 2000b). Further, injunctive norms only exerted a unique effect on intentions for four of the health behaviours investigated (i.e., exercise 30 mins, avoid fat, avoid fast food, avoid sugar; see table 7.12). In all cases injunctive norms was a weaker predictor than both attitudes and self-efficacy. This finding is consistent with existing research which suggests that subjective/injunctive norms are a weaker predictor of intentions than either attitudes or PBC (Ajzen, 1991; Armitage et al., 2001; Conner & Armitage, 1998; McEachan et al., 2011; Rivis et al., 2003). Taken together these results suggest that individuals are most likely to intend to engage in regular exercise and maintain a healthy diet when they believe that doing so will be associated with positive outcomes, they believe they are capable of adopting these behaviours and (to a lesser extent) believe that important people in their life will approve.

Intentions were also found to be negatively associated with the maladaptive fear control responses. Although behavioural avoidance was the only fear control response which was a predictor of intentions within the context of the EIM, this may simply be due to multicollinearity between fear control responses. Consistent with the prediction of attitudes in this study, these results lend further support to the contention that maladaptive fear control responses are negatively associated with adaptive danger control responses (cf. Rippetoe, et al., 1987; Ruiter et al., 2003; Witte, 1992b; Witte & Allen, 2000), and lend support to the predictions of the EPPM (Witte, 1992a) and EIM. As such, these findings suggest that individuals are less likely to intend to engage in health protective behaviour if they engage in defensive strategies to reduce their fear about a health threat depicted in a health message.

Bivariate correlations revealed that individuals self-reported diet and exercise behaviour was consistently found to be associated self-efficacy. These behaviours were also associated with intentions for all health behaviours excluding avoiding foods high in fat – though in that case the correlation was in the predicted direction and approached significance. This suggests that individuals are likely to engage in diet and exercise behaviours if they intend to do so and believe that they will be capable of doing so. These findings are consistent with the prediction of the TPB (e.g., Ajzen, 1985, 1991) and EIM. Meta-analytic reviews suggest that both intentions and self-efficacy are significant predictors of diet and exercise behaviours (e.g., Hagger et al., 2002a; McEachan et al., 2011). Past behaviour was also associated with current diet and exercise behaviour for all health behaviours investigated. This suggests that individuals who previously engaged in regular exercise and maintained a healthy diet were more likely to continue doing so. These findings are consistent with many findings in the health behaviour literature which suggest that past behaviour is a strong predictor of future behaviour (cf. Hagger et al.; McEachan et al.; Ouellette et al., 1998).

Several models, including the TRA, TPB and PMT-R, assume that intentions are the most important predictor of behaviour (Ajzen, 1991; Rogers, 1975, 1983; Sheeran, 2002b). However, the results of this study suggest that individuals' intentions are not a strong predictor of diet and exercise behaviour – explaining between 1-16% of the variance in behaviour (*M* = 8%). Sheeran (2002b) compiled results of several meta-analyses and found that intentions explained on average 28% of the variance in behaviour (range: 16% – 67%). However, behaviours investigated in that study were not limited to health behaviours. More recently McEachan et al., (2011) conducted a meta-analysis of TPB studies investigating health behaviours, finding that exercise intentions explained 20% of the variance in exercise behaviour and 14% of the variance in dietary behaviours. These variance estimates are larger than those found in the present study. Taken together these findings suggest that intentions are not necessarily a reliable predictor of behaviour.

Temporal stability of intentions has been found to moderate the effect of intentions on behaviour. When intentions are temporally stable the intention-behaviour link is stronger (Sheeran, 2002b; Doll & Ajzen, 1992). Further, as the time between the measurement of intentions and behaviour increases the strength of the intention-behaviour link (McEachan et al., 2011; Sheeran & Orbell, 1998). For this reason Fishbein et al. (2010) suggest that measurement of intentions should ideally be close in time to when the behaviour is to be performed (see also e.g., Ajzen, 1985, 1991; Fishbein et al., 1975). In the present study, this time period was approximately one month. According to McEachan et al. the median time period is five weeks for TPB studies investigating health behaviours. Therefore, the present study was about average within the literature in terms of the length of follow up. Nevertheless, it is possible that if this time period was shorter the intentions may have been a stronger predictor of behaviour.

Self-efficacy was a consistent predictor of diet and exercise behaviour and was consistently a stronger predictor than intentions. Contrary to predictions, in the context of the EIM model the effect of intentions on behaviour was attenuated to non-significance following the addition of self-efficacy to the model for each of the five specific health behaviours investigated (i.e., adopting a healthy diet was excluded as this requires the adoption of several related behaviours simultaneously). This suggests that rather than intentions being a direct predictor of behaviour, its effect may be mediated by self-efficacy. Other analyses from this study have established that self-efficacy is strongly associated with intentions (see also Armitage et al., 1999a, 1999b; Bui et al., 2013; Hagger et al., 2002a; Hodgkins et al.; Lippke et al., 2009; Milne et al., 2000; Plontikoff & Higginbotham, 1995, 1998, 2002; Plotnikoff, Rhodes, et al., 2009; Plotnikoff et al., 2010; Plotnikoff, Trinh, et al., 2009). This strong association may have served to attenuate the effect of intentions on behaviour due to multicollinearity. These results support the findings of Plotnikoff, Trinh et al. (2009) who found that intentions were a non-significant predictor of aerobic exercise and resistance training behaviour when controlling for self-efficacy. A strong association between self-efficacy and intentions was found in that study also. These results suggest that individuals may only act on their intentions to diet or exercise if they believe that they will be capable of adopting a particular behaviour. The results further suggest that individuals' perceptions of self-efficacy are more important to the prediction of diet and exercise behaviours than intentions. However, intentions and self-efficacy together only explained 20% of the variance in exercise and between 8 and 34% of the variance in dietary behaviours (M = 25%). These estimates are comparable to the results of McEachan et al's (2011) meta-analysis which suggested that intentions and PBC explain approximately 24% of the variance in exercise behaviour and 21.2% of the variance in dietary behaviours. This leaves much of the variance in behaviour unexplained by the direct predictors of behaviour according to the TPB (cf. Ajzen, 1991) and EIM. Therefore, both models may be inadequate for the prediction of diet and exercise behaviours.

Past behaviour was a significant predictor of three of the five behaviours investigated (i.e., exercise 30 minutes, avoid fast food and avoid soft drinks). Further, the addition of past behaviour to the model attenuated the effect of self-efficacy on measures of current diet and exercise behaviour. This suggests that a key reason individuals engage in specific diet or exercise behaviours is that they have done so before. It is possible that this occurs due to the individual engaging in these behaviours frequently over time and thereby developing a habit (Ouellette et al., 1998). Ouellette et al. argue that when a habit forms the link between past behaviour and future behaviour should be strong. In support of this they provided evidence that when the target behaviour was performed more frequently the past behaviour-future behaviour link was stronger than for infrequently performed behaviour. Similar to the present study McEachan et al. (2011) found that when past behaviour is added to a model regressing behaviour on intentions and PBC (similar to self-efficacy) the variance explained significantly increases and the effects of intentions and PBC are significantly attenuated. Ajzen (1991) argued that all predictors of behaviour should exert their effect on behaviour as mediated by intentions and PBC. The results of the current study do not support this view. Ajzen (2002b) argues that past behaviour cannot *cause* future behaviour; rather the link is spurious and can be explained by both past and future behaviours having the same predictors. Therefore, if the link between past behaviour and future behaviour is significant it means that not all of the predictors of behaviour were measured. Therefore, taken together the results of this study suggest that the socio-cognitive predictors of behaviour in the EIM and TPB may be inadequate for predicting diet and exercise behaviour and other predictors of behaviour must be sought.

Limitations

A limitation of the current project is the large attrition rates between parts of the study. Of the 545 participants who entered the study only 61 provided usable data for all three parts of the study. Two-hundred and twelve provided usable data for the baseline and intervention phases only. Although differences between those who continued their participation through all three parts of the study and those who did not were negligible, the reduced sample size reduced the power of analyses which used data from the intervention and follow-up phases of the study. This was especially the case for analyses pertaining to the predictors of behaviour. The limited sample size made power hungry analyses such as path analysis or structural equation modelling infeasible using the behaviour data. This necessitated the predictions of the model to be investigated piecemeal using progressive hierarchical regression analysis and analysis of variance. Nevertheless, these statistical techniques were certainly adequate for testing the predictions of the EIM and statistical power was not an issue for these regrression analyses (i.e., power to find a medium effect size exceeded .95).

Some provisions were put into place to ensure that participants completed the intervention and follow-up phases of the research. Student participants were given course credit piecemeal for their participation, such that they received more course credit for completing more parts of the study. However, participation in later parts of the study was optional (a research ethics requirement) and there were several studies students could choose from in order to obtain their course credit. As such, many students may have wished to participate in other studies to gain their course credit. Once students had obtained their course credit their incentive to participate was removed; they may have perceived that participating in further parts of the study would be of limited benefit to them, especially since they could spend the time studying for exams or socialising. Similarly, general public participants were given more chances to win the iPod touch when they participated in later parts of the study. However, the prospect of more chances to win this may not have been incentive enough to encourage further participation in the study. It should be noted that the study may have perceived by participants to be rather boring, the baseline and intervention phases contained over 150 items which were somewhat repetitive given that there was a focus on six separate health behaviours – necessitating the completion of six separate (but similar) self-efficacy, response-efficacy, attitudes, subjective norms, descriptive norms, perceived controllability and intentions measures. Therefore the repetitive nature of the study may have discouraged participants from continuing their participation.

Two limitations of the study may have affected the impact of the health message on participants. The first is that participants needed to complete several measures therefore there was a time delay between the presentation of the health message and responding to items measuring threat and efficacy perceptions, attitudes and intentions. Given this time delay the immediate effect of the health message may have worn off. This may explain why the presentation of the health messages elicited little change in participants' threat and efficacy perceptions, attitudes and intentions. In contrast measures of fear, defensive message responses and fear control responses were presented immediately following the health message. Recall that those who viewed the high threat message experienced greater perceptions of fear, generated more responses minimising the threat and reported greater reactance. This suggests that the health message had an effect on measures presented immediately after the health message was presented, but had comparatively little effect on those which were presented later. It should be noted that this delay would not have been long, just the amount of time that it took participants to complete measures of fear, defensive message responses and fear control (which could be conservatively estimated as fifteen minutes). What this may suggest is that the effect of fear appeal messages is time limited. Beyond ten minutes after the presentation of the fear appeal message the effect of the message becomes negligible. However, if fear appeal messages are so time limited in their effect they are not likely to motivate any meaningful behaviour change – i.e., ten minutes is not enough time to adopt a healthy diet or regular exercise routine. Future research could investigate the effect of fear appeal messages on threat and efficacy perceptions measured at different time delays to investigate this effect further.

A related limitation is that predictors of several health behaviours were investigated. This methodology was employed in order to cross validate any findings across separate health behaviours, and to investigate whether there were major differences in the predictors of various diet and exercise behaviours. However, this means that the health messages presented needed to elicit change in six (albeit related) health behaviours rather than just one as is the norm for fear appeal research (e.g., Cho et al., 2006; Rippetoe et al., 1987; Maddux et al., 1983; Rogers et al., 1976; Ruiter et al., 2003; Witte, 1992b, 1994; Witte & Morrison, 2000). However, some previous research has investigated the predictors of multiple health behaviours in a single study (e.g., Cho, 2003; Self et al., 1990). It is possible that the health messages may have been more effective in changing perceptions of threat and efficacy, attitudes and intentions if they targeted a single behaviour. However, in defence of the methodology, reducing the rates of obesity requires changes in a number of health behaviours including increasing rates of regular exercise and healthy diet (ABS, 2013; AIHW, 2010: WHO, 2002, 2012). Further, health messages targeting obesity often target more than one health behaviour (DoHA, 2010b; Miller & Tuffin, 2009). Therefore, it is important to investigate whether health messages are able to effectively target multiple related health behaviours simultaneously and motivate adaptive change in attitudes, intentions and behaviour. The results of the present study suggest that they are not.

A final limitation of the study is that it provides a sophisticated account of the factors leading to individuals' behavioural intentions, but has not offered any novel predictions concerning the prediction of behaviour itself. This is likely to be a key reason why prediction of intentions was stronger than the prediction of behaviour. Although health behaviour theory often assumes that the most important predictor of behaviour is intentions (Ajzen, 1991; Fishbein et al., 1975; Rogers, 1975, 1983), this assumption has been called into question (Sheeran, 2002c).

There is limited research which has focused on other predictors which impact directly on individuals' behaviour. For example, Godin, Conner and Sheeran (2005) found that when individuals' intentions were aligned with their moral norms – belief that they are morally obliged to engage in a behaviour – their intentions were more strongly associated with the performance of the behaviour. Some theorists have focused on two phases of behavioural enactment: a motivational phase – where the individual forms an intention to engage in a behaviour; and a volitional stage – where the individual enacts their intentions and maintains the behaviour over time (e.g., Gollwitzer, 1993, 1996, 1999; Schwarzer, 1992, 2001, 2008). In these terms the present study has focused mostly on the motivational stage. However, it is argued that once individuals have formed an intention they still need to develop a specific plan for engaging in the behaviour – i.e., how, when and where they will enact their intentions (Gollwitzer, 1999). This sort of specific planning has been found to predict behaviour (Gollwitzer & Oettingen, 1998; Sniehotta, Scholz & Schwarzer, 2005). Once the behaviour is enacted individuals must also maintain the behaviour over time, individuals' self-efficacy that they can maintain the behaviour (i.e., maintenance self-efficacy) is believed to be important in determining how much effort they are willing to expend to maintain the behaviour (Luszcynnska & Schwarzer, 2003). Sniehotta et al. found that planning and maintenance self-efficacy fully mediated the effect of intentions on exercise behaviour. The EIM was forwarded not as a definitive model, but as a working model to be improved upon over time. The results of this study suggest that although this model has strengths in its capacity to predict attitudes, self-efficacy and intentions, a relative weakness of the model is its ability to predict health behaviour. As such, factors such as moral norms, planning and maintenance self-efficacy could be easily incorporated into the EIM framework and may improve the prediction of diet and exercise behaviour.

Summary

Study 4 aimed to test the predictions of the EIM – a model developed for this study which incorporated predictions of the EPPM (Witte, 1992a), TPB (Ajzen, 1991), Stage Model (Das et al., 2003; de Hoog et al., 2005, 2007, 2008) and RPA (Rimal 2001; Rimal et al., 2003). The results of the study suggested that the intensity of the threat and efficacy messages did not affect perceptions of threat (susceptibility) or efficacy (self- and response-efficacy) perceptions. Accordingly individuals' intentions and attitudes did not change as a result of the threat or efficacy message. However, the threat message did elicit change in some maladaptive responses such as increased fear, generation of thoughts minimising the health threat and reactance. This suggests that not only do fear provoking health messages not lead to increases in adaptive protective responses; they may lead to maladaptive responses which are negatively associated with adaptive attitudes and intentions. Therefore, such messages may be counterproductive and should be used with caution (cf. Ruiter et al., 2005).

The EIM also predicted that individuals existing psychographic characteristics would moderate their response to the health message. However, contrary to predictions the effect of psychographic group on outcomes (i.e., threat and efficacy perceptions, health knowledge) was for the most part independent of the health message characteristics. This suggests that changes occurred as a result of being presented with a health message regardless of its content. An exception to this was that avoidant individuals generated more minimising thoughts when presented with a high threat message – suggesting that highly threatening messages may lead to defensive responses in an important target population of people who perceive themselves to be susceptible to the health threat but believe they cannot take effective action to alleviate that threat.

The EIM fared much better at predicting individuals' intentions and behaviour from their current psychological characteristics. The results suggest that perceptions of susceptibility and fear are associated with defensive and maladaptive responses to the health message. In contrast, perceptions of severity and response-efficacy were negatively associated with maladaptive responding suggesting that when people do not believe they can take effective action to alleviate a health threat they may engage in maladaptive responding as a means of reducing their fear (cf. Witte, 1992a). As predicted by the EIM, self-efficacy was found to be determined by perceived controllability and past behaviour, and mediated the effects of these variables on intentions. Response-efficacy was found to predict attitudes, and attitudes, injunctive norms and self-efficacy predicted intentions. Both attitudes and intentions were negatively associated with fear control processes, suggesting that defensive responses to a fear appeal message are associated with less message acceptance (cf. Witte, 1992a). Current diet and exercise behaviour was found to be associated with intentions, self-efficacy and past behaviour. However, contrary to predictions intentions were not an important predictor in the context of the EIM model. The prediction of behaviour using the model was relatively poor suggesting that the model could be augmented with more direct predictors of behaviour such as planning and maintenance self-efficacy (Gollwitzer, 1993, 1996, 1999; Luszcynska et al., 2003; Schwarzer, 1992, 2001, 2008; Sniehotta et al., 2005).

The results of Study 4 have validated several unique predictions of the EIM – predictions between variables from different models. These predictions include: the positive association between response-efficacy and attitudes; defensive message processing variables were found to be associated with fear control processes; self-efficacy mediates the effects of perceived controllability and past behaviour on intentions; avoidant individuals more likely to engage in defensive health message processing in response to a high threat message. The model also explained the predictors of numerous outcomes of these theories including fear, defensive message processing, fear control process, attitudes, intentions and behaviour. As such, investigating the predictions of an integrated model was useful as it highlighted connections between constructs from other models – connections which would not have been investigated outside of the context of an integrated model. Further, the EIM was able to explain a broader range of outcomes than any of its constituent models whilst retaining the important predictions of those constituent models. However, there is still room to improve this model. Predictions from other models of health behaviour may be incorporated into the EIM framework in order to increase its explanatory power.

Chapter 8: Summary, Overarching Implications of Findings and Conclusion

The research presented in this thesis achieved each of its aims. As discussed in Chapter 3, the aims of this thesis were threefold: 1) to investigate whether the TPB and PMT-R each represent a complete and sufficient description of the psychosocial determinants of health behaviour; 2) To compare the TPB and PMT-R for their effectiveness and accuracy in predicting health behaviours; and 3) to develop an integrated model of health behaviour which combines predictions from existing health behaviour models, and test the predictions of these integrated models. Study 1 aimed to investigate whether the prediction of exercise and dietary behaviour intentions using the PMT-R could be improved when health knowledge was added as an additional predictor. Studies 2 and 3 investigated whether the prediction of smoking behaviour (Study 2) and diet and exercise (Study 3) behavioural intentions using both the TPB and PMT-R could be improved with the addition of past behaviour and health knowledge. Secondly, PMT-R and TPB were compared using AIC. values to ascertain which was the most parsimonious model which could explain the greatest proportion of the variance in behavioural intentions. Finally, an integrated model combining the predictions of the TPB and PMT-R was forwarded and tested. Study 4 extended the findings of Studies 1, 2 and 3 by proposing and testing an integrated model of health behaviour which combined predictions from the EPPM, TPB, Stage Model and RPA. This model was designed to predict responses to a health message based on the threat and efficacy content of the message and the individuals' psychographic characteristics. It also made predictions concerning the psychosocial predictors of health protective attitudes, intentions and behaviour; in addition to fear, defensive health message processing and maladaptive fear control responses (i.e., defensive avoidance and reactance).

Taken together findings from these studies suggest that methodologies that employ model comparison are useful for highlighting which model of a candidate set is the best explanation for the data. Further, methodologies that employ theoretical integration can be used to generate novel predictions, highlight relationships between variables across theoretical models and explain a greater number of pertinent outcomes than the constituent models utilised.

Study 1: Investigating the Effect of Health Knowledge on Individuals Responsiveness to Fear Appeal Messages

Study 1 aimed to investigate the effect that individuals' health knowledge has on how they respond to a fear appeal message. Further, consistent with the overall aims of the thesis it aimed to investigate whether health knowledge is an important predictor of intentions to engage in regular exercise or adopt a healthy diet after controlling for PMT-R predictors. The predictions of Study 1 included: 1) individuals exposed to the moderate-threat message would have greater health information retention when compared with those in the benign or high-threat condition; 2) for individuals with high health knowledge the moderate-threat message will lead to the greatest intentions, whereas for individuals with low health knowledge the high-threat message will lead to the greatest intentions; 3) health knowledge will be positively associated with intentions; 4) the PMT-R variables severity, susceptibility, response-efficacy, self-efficacy would each be positively associated with intentions, and costs would be negatively associated; and 5) health knowledge would add significant variance to models of diet and exercise intentions after controlling for the effects of the PMT-R variables. Ultimately, these predictions were not supported (see Chapter 4).

Contrary to predictions, both individuals' health knowledge and behavioural intentions were similar whether they viewed a moderately or highly threatening health message or a health message unrelated to health. The effect of the health messages on intentions was not moderated by prior health knowledge. Further, health knowledge was not found to be associated with intentions to engage in regular exercise or maintain a healthy diet. These findings suggest that health knowledge is unaffected by the presentation of threatening health messages suggesting that threatening health information does little to motivate individuals to attend to and retain health information. Further health knowledge was not associated with intentions to exercise or maintain a healthy diet. Taken together these findings suggest that health information retention and health knowledge may not be important targets for health promotion in that health knowledge appears to be ineffective for increasing the adoption of health protective responses.

Study 1 also investigated the predictions of PMT-R (cf. Rogers, 1983), but provided only partial support for the model. The only PMT-R variables found to be significant predictors of healthy diet and exercise intentions were self-efficacy and costs. Perceived susceptibility, severity and response-efficacy were non-significant predictors. Further, health knowledge was not found to add unique variance to the PMT-R model – suggesting that it is unlikely to be useful as an additional predictor within the model. These findings lend support to previous research which suggests that self-efficacy is the only important PMT-R predictor of health behaviour intentions (e.g., Hodgkins et al.; Plotnikoff et al. 1995; Plotnikoff, Rhodes et al., 2009; Wallace, 2002). These results suggest that interventions aimed at increasing rates of exercise and healthy diet should focus on raising self-efficacy and removing barriers to engaging in exercise or maintaining a healthy diet. Such interventions may have greater potential for reducing unhealthy behaviours than threatening health messages and education campaigns.

The interpretation of the results of Study 1 must be made with consideration of some methodological flaws with the study. These included the information presented to participants for later recall may have been perceived as threatening – potentially impacting on participants perceptions of susceptibility and severity. There was also no measure of prior knowledge employed meaning that the researchers could not be sure whether participants' information retention scores reflected their recall of the information presented earlier or information they were aware of prior to entering the study. Finally, the items were simply general knowledge about obesity and obesity prevention, few concerned individuals awareness of the utility of the behaviours investigated (i.e., healthy diet and exercise). As such, the items may have been less relevant (see Chapter 4 for a fuller discussion of the limitations). These limitations were addressed in Studies 2, 3 and 4.

Study 2: Comparing and Integrating the Predictions of Protection Motivation Theory and the Theory of Planned Behaviour in the Context of Smoking

The principle aim of Study 2 was to investigate the predictors of intentions to engage in three behaviours consistent with quitting smoking: making a quit attempt, using nicotine replacement therapy (including patches, lozenges, chewing gum etc.) and avoiding situations where the urge to smoke is increased (see Chapter 5). Both the TPB and PMT-R were applied to the prediction of these behaviours and these models were compared for their utility in explaining behavioural intentions. Finally, Study 2 aimed to test the predictions of an integrated model combining the predictions of the TPB and PMT-R with further predictions concerning past behaviour, smoking habit strength and health knowledge.

Results of Study 2 suggested that both models were useful for the prediction of smoking behaviour intentions. However, the TPB was a better approximating model for each of the three health behaviours investigated. Suggesting that the TPB should be the preferred model to be applied by researchers and practitioners interested in predicting quitting smoking behaviour intentions. However, the addition of past behaviour and health knowledge was found to increase the predictive validity of both PMT-R and the TPB. This suggests that both models may be insufficient – representing incomplete accounts of the psychosocial predictors of behavioural intentions – as predictors outside of these theoretical frameworks contribute unique variance to the prediction of behavioural intentions (cf. Ajzen, 1991, 2002b, 2011; Conner et al., 1998; Fishbein et al., 2010).

An unexpected finding was that individuals' health knowledge concerning the health effects of smoking was negatively associated with intentions to quit smoking and use NRT. This suggests that smokers are not motivated to change their behaviour by their knowledge of the negative health effects associated with smoking. Further, correlations between perceptions of threat (perceived susceptibility and severity) and intentions were generally weak or non-significant. In contrast, normative influences were stronger predictors of health protective intentions. This suggests that individuals are more likely to be motivated by the perceived social benefits associated with quitting smoking than their knowledge or perceptions of risk. Therefore, the results of this study suggest that bombarding smokers with health messages detailing the negative health effects of smoking (as is the case in Australia), may not only be ineffective, but counterproductive. This effect may be explained by a reactance response – individuals may interpret health messages as an attack on their freedom and continue to smoke as a means of maintaining their self-esteem (cf. Arndt et al. 2003; Brehm, 1966; Brehm & Brehm, 1981; Greenberg et al., 1997; Jessop & Wade, 2008; Routledge et al., 2004; Taubman Ben-Ari et al., 1999). If this is the case then health message designers should apply threatening health messages targeting smokers with caution, as they may lead to the opposite of the desired effect.

Tests of the integrated model revealed that response-efficacy was a consistent predictor of attitudes, and attitudes mediated the effect of response-efficacy on intentions. This indicates that individuals' are more likely to generate positive attitudes concerning quitting smoking when they believe that that quitting smoking will be effective in alleviating the adverse health effects associated with smoking. Self-efficacy was found to be predicted by perceived controllability and past smoking behaviour (i.e., cigarettes smoked per day) and mediated the effect of these variables on intentions. This suggests that individual's beliefs that they can quit smoking are determined by whether they have control over their quitting behaviour and how strong their smoking habit is. Those who smoked more cigarettes per day had lower self-efficacy for quitting.

Individuals' intentions to quit smoking were predicted by injunctive norms and self-efficacy. Indicating that individuals are more likely to intend to quit if they believe they can make a successful quit attempt and believe important people in their lives will approve of their decision to quit. These findings are mostly consistent with previous research (e.g., Godin, Valois, LePage & Desharnais, 1992; Moan & Rise, 2006; Norman, Conner & Bell, 1999), but for attitudes not predicting intentions; however this finding did confirm the results of Norman et al. Conversely intentions to use NRT and avoid situations where the urge to smoke is increased were predicted by attitudes and descriptive norms, and attitudes respectively. This suggests that individuals are most likely to use NRT or avoid situations if they believe that doing so will be associated with positive outcomes (presumably a successful quit attempt). Further, individuals were also more likely to use NRT if they have observed important people in their lives using NRT. Research suggests that smokers may believe that NRT is ineffective or even harmful (Etter et al., 2001). As such, these misconceptions may have been dispelled in those who know somebody who has used NRT with success. Self-efficacy may not have been an important predictor of using NRT as obtaining and using NRT is a relatively simple behaviour requiring considerably less effort than, for example, quitting smoking (cf. Ajzen, 1991). Taken together the results of this study partially supported the predictions of the integrated model.

Study 2 introduced several novel findings to the health behaviour literature. Study 2 was the first to apply the TPB and PMT-R to the prediction of intentions to use NRT or avoid situations where the urge to smoke is increased. It was also the first to directly compare these models for their utility in explaining smoking behaviour intentions. One novel finding was that individuals' awareness of the negative health effects of smoking is negatively associated with their intentions to quit, not positively as may be expected (and tacitly assumed by fear appeal campaign designers). Study 2 also made predictions concerning associations between constructs from PMT-R and the TPB. Response-efficacy was found to be a predictor of attitudes and the effect of perceived controllability on intentions was fully mediated by self-efficacy. These findings are unique to the present study (and were further validated in Studies 3 and 4).

Study 2 represents an example of how model comparison and theoretical integration can be applied to the prediction of health behaviour intentions. The results suggested that the TPB was consistently a better approximating model than PMT-R, but that both models can be augmented through the addition of health knowledge, past behaviour and smoking habit strength. Many of the predictions of the proposed integrated model were not supported. However, combining the predictions of PMT-R and TPB did lead to some novel findings highlighting key relationships between constructs of these models. As such, the results of Study 2 suggest that theoretical integration can be used to increase our understanding of the psychosocial determinants of health behaviour intentions.

Study 3: Comparing and Integrating the Predictions of Protection Motivation Theory and the Theory of Planned Behaviour in the Context of Obesity, Diet and Exercise

Study 3 represented a replication of Study 2 with a larger sample size and in a different health context – obesity, diet and exercise. The principle aim of Study 3 was to investigate the predictors of intentions to engages in six health behaviours which are likely to reduce the risk of weight-related illnesses including: exercising 30 minutes per day five days per week; maintaining a healthy diet; avoiding foods high in fat; avoiding fast food high in fat; avoiding soft drinks high in sugar; and avoiding foods high in sugar. Similar to Study 2, the specific aims of Study 3 included investigating the utility of both PMT-R and TPB for predicting diet and exercise intentions; compare these models for their accuracy in predicting intentions; and test the predictions of an integrated model combining the predictions of PMT-R and TPB (this model was identical to that tested in Study 2; see Chapter 5).

Similar to Study 2, the results of Study 3 showed that both the TPB and PMT-R were useful models for explaining intentions to exercise and maintain a healthy diet. Although PMT-R was found to be the best approximating model for predicting exercise intentions, the difference between it and the TPB was very small – indicating that both models are essentially equivalent for predicting exercise intentions. In contrast, the TPB was clearly the superior approximating model for predicting intentions to engage in each of the five dietary behaviours – suggesting that the TPB should be preferred over PMT-R by researchers and practitioners for the prediction of dietary behaviour intentions. As in Study 2, many of the unique predictions of the integrated model were supported. These included response-efficacy predicting attitudes, and perceived controllability and past behaviour predicting self-efficacy. However, goodness of fit statistics revealed that ultimately the model was not a good fit to the data for each of the six health behaviours investigated – suggesting the model may have been mis-specified. Modifications were made to the models in order to improve model fit. However, only the model applied to predicting intentions to maintain a healthy diet achieved acceptable model fit. Nevertheless, Study 3 represents another example of how model comparison and theoretical integration can be successfully applied in the health behaviour literature. Useful knowledge has been gained suggesting that the TPB should be preferred over PMT-R for predicting dietary intentions; and both are essentially equivalent for predicting exercise intentions. Further, the study has validated relationships between constructs of these models including positive associations between response-efficacy and attitudes, perceived controllability and self-efficacy and past behaviour and self-efficacy; and highlighted new relationships such as the relationship between descriptive norms and self-efficacy (cf. Bandura, 1977a, 1982, 1998).

Self-efficacy and attitudes were each found to be consistent predictors of behavioural intentions. This indicates that individuals are more likely to intend to engage in a particular behaviour if they believe they are capable of successfully engaging in this behaviour and believe that doing so will be associated with positive outcomes (cf. Ajzen, 1991; Bandura, 1986, 1998). These findings are consistent with previous research which suggests that self-efficacy and attitudes are strong predictors of health behaviour intentions (e.g., Armitage et al., 1999a, 1999b; Armitage et al., 2001; Bui et al., 2013; Floyd et al., 2000; Godin et al., 1996; Hagger, Chatzisarantis & Biddle, 2001; Hagger et al., 2002a, 2002b; Hagger et al., 2005; McEachan et al., 2011; Milne et al., 2000; Nejad et al., 2006; Plotnikoff et al., 1995, 1998, 2002; Plotnikoff, Rhodes et al., 2009; Plotnikoff, Trinh et al., 2009; Povey et al., 2000a; Rhodes et al., 2003; Wallace, 2002; Witte & Allen, 2000). These findings support the TPB which suggests that attitudes and PBC (including self-efficacy) are key predictors of intentions (cf. Ajzen, 1991).

Injunctive and/or descriptive norms were predictors for each of the dietary behaviours. However, their effect was relatively weak. These findings are consistent with meta-analytic reviews which suggest that normative influences are less important predictors of diet and exercise intentions than attitudes or self-efficacy (e.g., Hagger et al., 2002b; McEachan et al., 2011). Health knowledge was also a relatively weak predictor of dietary intentions: threat health knowledge did not predict intentions at all, and efficacy health knowledge was only a significant predictor for intentions to avoid foods high in fat and sugar. As such, simply informing individuals about a health issue is likely to be insufficient to achieve significant behaviour change. Health promotion interventions should also aim to increase self-efficacy with regards to adopting healthy behaviours.

Contrary to predictions, susceptibility and severity did not explain unique variance in intentions for any of the health behaviours investigated. These findings are consistent with previous research which suggests that coping/efficacy appraisal variables (i.e., self- and response-efficacy) are stronger predictors of intentions and behaviour than threat appraisal variables (e.g., Bui et al., 2013; Lippke et al., 2009; Floyd et al., 2000; Hodgkins et al., 1998; Maddux et al., 1983; Milne et al., 2000; Plotnikoff et al. 1995; Plotnikoff, Rhodes et al., 2009; Plotnikoff et al., 2010; Plotnikoff, Trinh et al., 2009; Rogers et al., 1976). This finding suggests that health messages which aim to increase individuals' perceptions of threat may be of limited usefulness when applied to diet and exercise behaviours.

Mixed support was found for the integrated model. Contrary to predictions susceptibility and health knowledge did not predict attitudes; and severity only predicted attitudes for one of the six health behaviours investigated. The relationships between self-efficacy and health knowledge were generally weak or non-significant. These numerous negative findings suggest that the model was likely to be mis-specified – particularly in its predictions concerning the effects on health knowledge on predictor variables. This indicates the individuals' level of health knowledge is unlikely to be an important predictor of their adoption of health behaviours, as it is only weakly associated with intentions and more proximal predictors of intentions.

The predictions concerning more proximal predictors of intentions were generally better supported. Attitudes and self-efficacy were found to predict intentions for each of the health behaviours investigated. Injunctive norms were found to predict intentions for each of the five dietary behaviours (but not exercise intentions) and descriptive norms were found to predict intentions to avoid fast food and maintain a healthy diet. Perceived controllability and past behaviour each predicted self-efficacy and response-efficacy was a consistent predictor of attitudes. Further self-efficacy mediated the effects of both perceived controllability and past behaviour on intentions; and attitudes mediated the effect of response-efficacy on intentions. Each of these findings was consistent with the predictions of the integrated model.

The integrated model investigated in Studies 2 and 3 received mixed support. Its predictions concerning health knowledge were not supported. However, predictions concerning more proximal predictors of intentions were supported. Nevertheless, the model was limited in that it focused on behavioural intentions alone as an outcome variable. Models such as the EPPM and Stage Model focus on multiple outcomes such as fear, fear control processes (e.g., defensive avoidance, reactance), defensive message processing responses and behaviour (cf. Das et al., 2003; de Hoog et al., 2005, 2007, 2008; Witte, 1992; Witte & Allen, 2000). The integrated model also only explained what the characteristics are of a person who intends to engage in health protective behaviour. It did not explain how those characteristics could be changed in order to motivate health protective behaviour in non-compliers. The Extended Integrated Model (EIM) developed and tested in Study 4 was designed to explain multiple outcomes from a fear appeal message based on the characteristics of the message and the individual's existing characteristics.

Study 4: Development and Testing of an Integrated Model of Fear Appeal Outcomes

Study 4 extended the findings of Studies 2 and 3 by forwarding an extension of the integrated model investigated in those studies (i.e., the EIM). This EIM combined predictions from the EPPM (Witte, 1992a), TPB (Ajzen, 1985, 1987, 1991), Stage Model (Das et al., 2003; de Hoog et al., 2005, 2007, 2008) and the RPA (Rimal, 2001; Rimal et al., 2003; see figure 7.1 and table 7.1). This EIM built upon the integrated model investigated in Studies 2 and 3, but added additional predictions concerning individuals' responses to fear appeal messages. According to the EIM, individuals' responses to fear appeal messages are moderated by the characteristics of the health message and the individuals' existing personal characteristics (psychographic characteristics). The EIM did not just explain intentions and behaviour, but also fear, defensive responses to the fear appeal message and maladaptive responses to the message such as reactance and defensive avoidance. Many of the predictions of the EIM were unique in the health behaviour literature. Study 4 aimed to test the predictions of the EIM. The results of Study 4 are fully discussed in Chapter 7; the following represents a summary of the findings of Study 4.

Ultimately many of the predictions of the EIM concerning the effect of the health messages on outcomes were not supported. The threat and efficacy messages failed to elicit change in participants' perceptions of threat and efficacy. Most likely as a result of this, the health message also failed to elicit any significant change in participants' attitudes or intentions. These findings are inconsistent with the predictions of the EPPM which would suggest that highly threatening messages should lead to increases in perceptions of threat, and messages highlighting the effectiveness of responses for reducing ones risk should be associated with increases in perceptions of efficacy (Witte, 1992a). However, consistent with the predictions of the EIM (and EPPM; Witte), individuals perceptions of fear increased with the intensity of the threat message. Further individuals who viewed the high threat message were most likely to engage in reactance responses – vilifying the message as manipulative, exploitative or overblown. Taken together these findings suggest that fear appeal messages may be ineffective for motivating individuals to engage in regular exercise or maintain a healthy diet.

It is unlikely that poor health message design is responsible for the failure of the messages to affect change in perceptions of threat and efficacy from baseline. The messages were developed in accordance with previous fear appeal research (e.g., Witte, 1992a, 1994) and followed guidelines for the development of fear appeal messages by Witte (1993). Further, perceptions of fear were increased in response to the high threat message as predicted. In Chapter 7, it was argued that the lack of effect may be due to the large amount of information available to Australians' concerning obesity, diet and exercise (cf. AIHW, 2012; DoHA, 2010; Bonfiglioli, 2007; Miller et al., 2009; Preventative Health Taskforce, 2010). In such an intellectual climate, individuals have many opportunities to consider their personal risk of developing weight related illnesses and whether they believe they can take effective action to mitigate their risk. Therefore, their perceptions of threat and efficacy may not be amenable to change in response to a single health message. This suggests that there may be a limit to the possible effectiveness of health messages applied to a particular health issue. Such messages may be effective for health issues which have not yet been the target of health promotion messages. But as messages concerning a health issue become more widespread individuals' perceptions of person threat and efficacy become entrenched. Ironically, the presentation of several health messages targeting a health issue may mean that subsequent messages have less and less impact (cf. Halkjelsvik, et al., 2013).

Contrary to predictions, the effect of the health messages on threat and efficacy perceptions were not moderated by psychographic group. However, this is unsurprising given that we now know that the threat and efficacy messages were not associated with changes in threat and efficacy perceptions from baseline. Those who had relatively low perceptions of threat (susceptibility and severity) at baseline (i.e., proactive and indifferent groups) were found to have increased perceptions of susceptibility and severity immediately following the presentation of the health message. Further, proactive individuals reported lower self-efficacy following the presentation of the health message when compared to baseline. However these effects, while significant, were quite small. These small effects are consistent with the notion that further health messages targeting obesity, diet and exercise are unlikely to elicit large changes in threat and efficacy perceptions given the proliferation of such information within Australia presently (cf. AIHW, 2012; Australian Government, 2010; Bonfiglioli, 2007;

Halkjelsvik, et al., 2013; Miller et al., 2009; National Preventative Taskforce, 2010). Small increases in participants' intentions to engage in health protective behaviour and positive attitudes were observed between the baseline and intervention phases of Study 4. However, these effects were not moderated by psychographic group or the health message presented. This suggests that the presentation of a health message – regardless of its threat/efficacy content – may have a small effect on certain individuals' perceptions of threat and efficacy. However, this small effect did not translate into systematic changes in attitudes or behavioural intentions within these groups.

The only findings where individuals' psychographic group moderated the effect of the health message on outcomes was for defensive message processing. Avoidant individuals were most likely to engage in defensive message processing in response to a high threat message. According to the Stage Model individuals with high perceptions of susceptibility (i.e., avoidant and responsive individuals) should be most likely to engage in defensive message processing when threatened. However, the results of the present study indicated that responsive individuals did not respond defensively to the high threat message – suggesting that this effect is moderated by efficacy perceptions. This finding is consistent with the predictions of the EIM, but inconsistent with the predictions of the Stage Model which predicted only a main effect of susceptibility on defensive processing. Taken together the results of Study 4 provided limited support to the predictions of the EIM as they apply to the effects of the health message on outcomes. By extension these findings are also inconsistent with the predictions of the Stage Model and EPPM.

Study 4 also investigated relationships between variables between constructs from the TPB, EPPM and the Stage Model. The results suggested that perceptions of susceptibility and fear are generally associated with increases in maladaptive defensive responses (i.e., defensive avoidance, minimising thoughts, reactance). These findings are consistent with fear appeal theory and suggest that threatened and fearful individuals may engage in defensive responses as a means of reducing their fear, ignoring the health threat or reaching a preferred conclusion that they are either not at risk or can take effective action to reduce their risk (cf. de Hoog et al., 2005, 2007, 2008; Witte, 1992a; Witte & Allen, 2000). As such, messages designed to increase perceptions of fear or susceptibility may backfire and should be used with caution (cf. Ruiter et al., 2003; Ruiter et al., 2005). In contrast perceptions of severity and response-efficacy were either found to be unassociated or negatively associated with maladaptive responses. This suggests that the effects of susceptibility and severity on maladaptive responses differ. As such, these variables should be considered separately rather than as constituent parts of the unitary threat construct (as in the EPPM; cf. Witte, 1992a, 1994). Further, individuals' belief that there are effective responses to reduce risk may protect against engaging in maladaptive responses to threatening health messages.

Similar to the findings of Studies 2 and 3, perceived controllability and past behaviour were found to predict self-efficacy and response-efficacy predicted attitudes. Further, descriptive norms predicted self-efficacy, and self-efficacy predicted attitudes. Consistent with the predictions of the EIM and TPB (Ajzen, 1991), attitudes, injunctive norms and self-efficacy were each found to be associated with intentions to exercise and maintain healthy dietary habits. However, consistent with previous research injunctive norms was a weaker predictor than either attitudes or self-efficacy (cf. Ajzen, 1991; Armitage et al., 2001; Conner & Armitage, 1998; McEachan et al., 2011; Rivis et al., 2003). As predicted by the EIM and EPPM, both attitudes and intentions were also found to be negatively associated with fear control processes (cf. Witte, 1992a). These results support findings which suggest that maladaptive fear control responses are negatively associated with health protective responses (cf. Rippetoe & Rogers, 1987; Ruiter et al., 2003; Witte, 1992b; Witte & Allen, 2000).

Consistent with the predictions of the EIM and TPB, diet and exercise behaviour was found to be associated with self-efficacy and intentions. However, the effect of past behaviour on current behaviour was stronger and not fully mediated by self-efficacy and intentions as expected. This suggests that the socio-cognitive predictors of behaviour in the EIM and TPB may be inadequate for predicting diet and exercise behaviour as past behaviour explained residual variance in current behaviour (cf. Ajzen, 1991, 2002b). Surprisingly, intentions were a relatively poor predictor of behaviour. The effect of intentions on behaviour was attenuated to non-significance following the addition of self-efficacy and past behaviour to the model. This suggests that intentions are not necessarily a reliable predictor of behaviour (cf. Sheeran 2002b).

Study 4 led to the discovery of several new associations between variables from the TPB, EPPM, Stage Model and RPA. These findings included: avoidant (but not responsive) individuals engaging in defensive message processing in response to a high threat message; minimising thoughts and positive thoughts about the recommendation (Stage Model) are each associated with fear control processes (EPPM); response-efficacy (EPPM) was found to be positively associated with attitudes (TPB); descriptive norms positively associated with self-efficacy, and self-efficacy mediates the effect of perceived controllability and past behaviour on intentions. Study 4 was also the first study to investigate the predictors of fear control processes in the health behaviour literature. Although the support for the EIM was inconsistent, the generation of an integrated model of health behaviour led to several new predictions. Analyses guided by the EIM highlighted heretofore undiscovered associations between predictors across health behaviour models including positive associations between response-efficacy and the generation of positive thoughts about the recommendation; cognitive avoidance can be predicted by low levels of perceived severity and positive thoughts about the recommendation; and behavioural avoidance can be predicted by low levels of perceived severity, self-efficacy, response-efficacy, fear and positive thoughts about the recommendation (see Chapter 7). These findings have provided new insights into the socio-cognitive predictors of fear appeal outcomes and individuals responses to fear appeal messages. As such, investigating the predictions of an integrated model was useful as it highlighted connections between constructs from other models. Further, the EIM was able to explain a broader range of outcomes than any of its constituent models. Therefore, Study 4 has further demonstrated the utility of applying theoretical integration to the health behaviour literature.

Comparison of Findings between Studies

Studies 1 – 4 each investigated the predictors of behavioural intentions; and studies 2-4 further investigated the predictors of attitudes and self-efficacy. Tables 8.1-8.3 summarise the findings of these studies for easy comparison.

Comparing the Predictors of Intentions between Studies 1-4

Table 8.1 shows that self-efficacy was a predictor of intentions for all but two of the health behaviours investigated. These findings are consistent with the predictions of Social Cognitive Theory, TPB and PMT-R which each predict that self-efficacy is a key determinant of intentions and behaviour (Ajzen, 1991; Bandura, 1986, 1977, 1998; Rogers, 1983). Self-efficacy did not predict intentions to use nicotine replacement therapy or avoid situations where participants often feel the urge to smoke. It should be noted that these health behaviours may be relatively easy to perform and as such self-efficacy should be expected not to be a strong predictor (cf. Ajzen, 1991). Attitudes were also consistently a predictor of intentions across studies. The only health

Table 8.1

Summary of the Integrated Model Predictors of Intentions for Studies 1 – 4

Health Behaviour	Susc	Sev	SE	RE	Costs	HK	ATT	IN	DN	CA	BA	React
Healthy diet$_1$	✗	✗	✓	✗	✓	✗	–	–	–	–	–	–
Exercise$_1$	✗	✗	✓	✗	✓	✗	–	–	–	–	–	–
Quit smoking$_2$	–	–	✓	–	–	–	✗	✓	✗	–	–	–
NRT$_2$	–	–	✗	–	–	–	✓	✗	✓	–	–	–
Avoid$_2$	–	–	✗	–	–	–	✓	✗	✗	–	–	–
Exercise 30 mins$_3$	–	–	✓/✓	–	–	–	✓/✓	✗/✓	✗/✗	–/✗	–/✗	–/✗
Healthy diet$_3$	–	–	✓/✓	–	–	–	✓/✓	✓/✗	✓/✗	–/✗	–/✗	–/✗
Avoid fat$_3$	–	–	✓/✓	–	–	–	✓/✓	✓/✓	✗/✗	–/✗	–/-✓	–/✗
Fast food$_3$	–	–	✓/✓	–	–	–	✓/✓	✓/✓	✓/✗	–/✗	–/-✓	–/✗
Soft drink$_3$	–	–	✓/✓	–	–	–	✓/✓	✓/✗	✗/✗	–/✗	–/-✓	–/✗
Avoid sugar$_3$	–	–	✓/✓	–	–	–	✓/✓	✓/✓	✗/✗	–/✗	–/-✓	–/✗

Note: ✓ = effect significant; -✓ = effect significant with a negative association between predictor and outcome; ✗ = effect non-significant; – = relationship not investigated; ✓/✓= effect significant in both Study 3 and Study 4; ✗/✓ = effect non-significant in Study 3 but significant in Study 4; –/✗ = effect not investigated in Study 3 and non-significant in Study 4; $_1$ = findings from Study 1; $_2$ = findings from Study 2; $_3$ = findings from Study 3 (presented first) and Study 4 (presented last). Susc = susceptibility, Sev = severity, SE = self-efficacy, RE = response-efficacy, HK = health knowledge, ATT = attitudes, IN = Injunctive norms, DN = descriptive norms CA = cognitive avoidance, BA = behavioural avoidance, REACT = reactance, NRT = nicotine replacement therapy.

behaviour for which attitudes was not a significant predictor was intentions to quit smoking. These findings lend further support to the predictions of the TPB (cf. Ajzen). The effects of injunctive and descriptive norms on intentions were generally weaker than for attitudes and self-efficacy or non-significant. These findings are consistent with prior research which suggests that attitudes and self-efficacy are generally stronger predictors of intentions than normative influences (e.g., Ajzen; Armitage et al., 2001; Conner & Armitage, 1998; McEachan et al., 2011; Rivis et al., 2003). Taken together these findings suggest that attitudes and self-efficacy are robust predictors of intentions across a wide range of health behaviours. As such, these variables are likely to be robust general predictors of health behaviour intentions – especially when performing the target behaviour is difficult requiring considerable effort. Researchers interested in predicting or understanding health behaviour intentions should definitely use attitudes and self-efficacy as predictors.

A unique finding of Study 1 was that individuals were less likely to intend to engage in regular exercise or maintain a healthy diet if they believed that the costs of doing so outweighed the benefits. This finding makes intuitive sense as if a behaviour is perceived as too costly (i.e., in terms of time, money, discomfort or loss of pleasure) it is logical that individuals will be less likely to engage in the behaviour as it is conflicts with their self-interest. This finding is consistent with the PMT-R which suggests that perceived costs are negatively associated with health protective responses (Rogers, 1983). The costs measure from Study 1 may be viewed as a crude measure of an individuals' attitude towards the behaviour. Within the TPB, attitudes are conceptualised as the product of ones' beliefs about the likelihood of certain outcomes occurring as a result of engaging in a behaviour; and the extent to which these outcomes are positive or negative (cf. Ajzen, 1991). Indeed belief-based measures of attitudes are developed by eliciting how likely it is that a particular outcome will occur and their evaluation of that outcome as positive or negative (cf. Ajzen; Ajzen & Madden, 1986; Armitage et al., 1999b; Nejad et al., 2006). This implies a cost-benefit analysis is occurring with respect to the behaviour and its anticipated outcomes – such that individuals' attitudes are more positive to the extent that they believe that a behaviour is likely to be associated with a greater number of positive outcomes and fewer negative outcomes. As such, the costs measure within Study 1 may be viewed as a proxy measure of attitudes – lending further support to the findings of studies 2, 3 and 4.

Comparing the Predictors of Attitudes between Studies 2-4

The only consistent predictor of attitudes between studies 2, 3 and 4 was response-efficacy. This suggests that individuals' belief that a particular response is effective in reducing their health risk is an important anticipated positive outcome of that behaviour. Therefore, individuals' response-efficacy beliefs may be construed as positive behavioural beliefs within the context of the TPB. As such, response-efficacy (from the EPPM and PMT-R) is subsumed by attitudes within the TPB. Contrary to predictions of studies 2, 3 and 4, the effect of susceptibility and severity on attitudes (and intentions) was generally weak or non-significant – in most cases non-significant (see table 8.2). This suggests that individuals are generally not more likely to have positive attitudes concerning a health protective behaviour if they believe that they are susceptible to a severe health threat. This runs contrary to the conventional wisdom concerning fear appeal effectiveness which suggests that individuals will only be motivated to engage in health protective responses when they perceive a relevant health threat (cf. Ruiter et al.., 2001; Witte, 1992a). These findings suggest that individuals are not likely to be motivated by their perception of risk. In Study 4, self efficacy was found to be a predictor of attitudes for most health behaviours investigated. This suggests that individuals are more likely to hold a positive attitude about engaging in a behaviour if they believe they are capable of engaging in that behaviour (cf. Witte, 1992a). Behavioural avoidance was often found to be negatively associated with attitudes. This finding is consistent with the predictions of both the EIM and EPPM, which each suggest that maladaptive fear control processes are negatively associated with health protective responses (i.e., positive attitudes about the behaviour and intentions to engage in health protective behaviour; cf. Witte, 1992a; Witte & Allen, 2000).

Comparing the Predictors of Self-Efficacy between Studies 2-4

Self-efficacy was found to be predicted by perceived controllability for each of the health behaviours investigated in Studies 2, 3 and 4 (see table 8.3). It is perhaps unsurprising that perceived controllability and self-efficacy are highly correlated given that they are constituent parts of the PBC construct within the TPB (e.g., Ajzen, 2002; Armitage et al., 1999a, 1999b; Conner et al., 1998; Terry et al., 1995; Trafimow et al., 2002), are consistently found to be positively correlated (e.g., Armitage et al., 1999a, 1999b; Hagger et al., 2002; Hagger et al., 2005; Povey et al., 2000a), and many argue that self-efficacy and PBC are conceptually similar (e.g., Ajzen, 1985, 1991; Ajzen et al., 1985). Nevertheless, consistent with previous research, principle components analysis revealed that perceived controllability and self-efficacy were conceptually distinct (e.g., Ajzen, 2002; Armitage et al., 1999a, 1999b; Conner et al., 1998; Hagger et al., 2005; Hagger et al., 2002; Rhodes et al., 2003; Terry et al., 1995; Trafimow, et al., 2002; White et al., 1994). Most interestingly however self-efficacy was consistently found to be the only of the two PBC constructs to predict intentions and behaviour (cf. Armitage et al., 1999a, 1999b; Hagger et al., 2002; Hagger et al., 2005; Povey et al., 2000a). This suggests that the self-efficacy component is a more important predictor of intentions and behaviour and that the perceived controllability component may be

Table 8.2

Summary of the Integrated Model Predictors of Attitudes for Studies 2, 3 and 4

Health Behaviour	SUSC	SEV	RE	SE	SUSC*RE	SEV*RE	SUSC*SE	SEV*SE	HK-T	HK-E	MT	PTATR	CA	BA	REACT
Quit smoking$_1$	×	✓	✓	–	–	–	–	–	×	×	–	–	–	–	–
NRT$_1$	×	×	✓	–	–	–	–	–	×	×	–	–	–	–	–
Avoid$_1$	×	×	✓	–	–	–	–	–	-✓	✓	–	–	–	–	–
Exercise 30 mins$_2$	×/×	×/×	✓/✓	–/✓	–/×	–/×	–/×	–/×	×/–	×/–	–/×	–/×	–/×	–/×	–/×
Healthy diet$_2$	×/×	×/×	✓/✓	–/×	–/×	–/×	–/×	–/×	×/–	×/–	–/×	–/×	–/×	–/×	–/×
Avoid fat$_2$	×/×	✓/×	✓/✓	–/×	–/×	–/✓	–/×	–/×	×/–	×/–	–/×	–/×	–/×	–/-✓	–/×
Fast food$_2$	×/×	×/×	✓/✓	–/✓	–/×	–/×	–/×	–/×	×/–	×/–	–/×	–/×	–/×	–/-✓	–/×
Soft drink$_2$	×/×	×/×	✓/✓	–/✓	–/×	–/×	–/×	–/×	×/–	×/–	–/×	–/×	–/×	–/-✓	–/×
Avoid sugar$_2$	×/×	×/×	✓/✓	–/×	–/×	–/×	–/×	–/×	×/–	×/–	–/×	–/×	–/×	–/-✓	–/×

Note: ✓ = effect significant; -✓ = effect significant with a negative association between predictor and outcome; × = effect non-significant; – = relationship not investigated; ✓/✓= effect significant in both Study 3 and Study 4; ×/✓ = effect non-significant in Study 3 but significant in Study 4; –/× = effect not investigated in Study 3 and non-significant in Study 4; ×/– = effect non-significant in Study 3 and not investigated in Study 4; $_1$ = findings from Study 2; $_2$ = findings from Study 3 (presented first) and Study 4 (presented last). SUSC = susceptibility, SEV = severity, RE = response-efficacy, SE = self-efficacy, HK-T = threat health knowledge, HK-E = efficacy health knowledge, MT = minimising thoughts, PTATR = positive thoughts about the recommendation, CA = cognitive avoidance, BA = behavioural avoidance, REACT = reactance, NRT = nicotine replacement therapy.

Table 8.3

Summary of the Integrated Model Predictors of Self-efficacy for Studies 2, 3 and 4

Health Behaviour	PC	Quit	Dur-Q	Cig	Dur-S	Npat	L/G	AS	Exer	Fat	FF	SD	Sugar	DN	PTATR	HK-T	HT-E
Quit smoking$_1$	✓	✗	✗	✓	✗	–	–	–	–	–	–	–	–	–	–	✗	✓
NRT$_1$	✓	–	–	–	–	✗	✗	–	–	–	–	–	–	–	–	-✓	✗
Avoid$_1$	✓	–	–	–	–	–	–	✗	–	–	–	–	–	–	–	✗	✗
Exercise 30 mins$_2$	✓/✓	–	–	–	–	–	–	–	✓/✓	–	–	–	–	–/✓	–/✗	✗/-✓	-✓/✗
Healthy diet$_2$	✓/✓	–	–	–	–	–	–	–	–	✗	-✓/-✓	✗	✗	–/✓	–/✗	✗/✗	✗/✗
Avoid fat$_2$	✓/✓	–	–	–	–	–	–	–	–	-✓/-✓	–	–	–	–/✓	–/✗	✗/✗	✗/✗
Fast food$_2$	✓/✓	–	–	–	–	–	–	–	–	–	-✓/-✓	–	–	–/✓	–/✗	✗/✗	✗/✗
Soft drink$_2$	✓/✓	–	–	–	–	–	–	–	–	–	–	-✓/-✓	–	–/✗	–/✓	✓/✗	✗/✗
Avoid sugar$_2$	✓/✓	–	–	–	–	–	–	–	–	–	–	–	-✓/✗	–/✗	–/✗	✗/✗	✗/✗

Note: ✓ = effect significant; -✓ = effect significant with a negative association between predictor and outcome; ✗ = effect non-significant; – = relationship not investigated; ✓/✓= effect significant in both Study 3 and Study 4; ✗/✓ = effect non-significant in Study 3 but significant in Study 4; –/✗ = effect not investigated in Study 3 and non-significant in Study 4; $_1$ = findings from Study 2; $_2$ = findings from Study 3 (presented first) and Study 4 (presented last). PC = perceived controllability, Quit = previous quit attempt (yes/no), Dur-Q = duration of most recent quit attempt, Cig = number of cigarettes smoked per day, Dur-S = length of time individual has been a smoker, Npat = previous use of nicotine patches, L/G = previous use of other NRT products (e.g., lozenges/gum), AS = previous avoidance of situations where the urge to smoke is increased, Exer = past exercise behaviour, Fat = past intake of foods high in fat, FF = past intake of fast food, SD = past intake of soft drinks high in sugar, Sugar = previous intake of foods high in sugar, DN = Descriptive norms, PTATR = positive thoughts about the recommendation, HK-T = threat health knowledge, HK-E = efficacy health knowledge, NRT = nicotine replacement therapy.

redundant. Alternatively it is possible that individual's beliefs that they have control over their enactment of a behaviour is a prerequisite for the development of self-efficacy beliefs. After all if a person believes that they have no control over their enactment of a behaviour, logically they cannot be confident in their ability to successfully adopt that behaviour. This interpretation is consistent with the findings of the present research program which consistently found that self-efficacy mediated the effect of perceived controllability on intentions. This implies that perceived controllability may be indirectly associated with intentions via its effect on self-efficacy.

As predicted, the results of Studies 2, 3 and 4 suggest that individuals past behaviour was also often found to be associated with self-efficacy. This effect was observed in all but two of the health behaviours investigated. The use of NRT and avoiding situations where the participant often feels the urge to smoke were the two exceptions. These behaviours are likely to be relatively easy to perform and as such individuals' self-efficacy should be expected to be a less important determinant of their intentions and behaviour (cf. Ajzen, 1991). Nevertheless these findings suggest that individuals previously engaging in a health behaviour increases their confidence that they can engage in that behaviour again (cf. Bandura, 1977a, 1982). Self-efficacy was also found to partially mediate the effect of past behaviour on intentions for most of the health behaviours investigated. However, the direct effect of past behaviour remained significant. Ajzen (1991, 2002b) argued that if a health behaviour model is complete past behaviour should exert no direct effect on intentions or behaviour after controlling for the other psychosocial predictors. The fact that past behaviour did exert a direct effect on these outcomes suggests that further psychosocial predictors of intentions and behaviour should be sought (cf. Ajzen, 2002b; Fishbein et al., 2010). As discussed in Chapter 7, such predictors may include moral norms (Godin et al., 2005), planning or implementation intentions (Gollwitzer, 1999; Gollwitzer et al., 1998; Sniehotta et al., 2005) and maintenance self-efficacy (Luszcynnska et al., 2003; Sniehotta et al.).

Taken together the results of studies 1-4 suggest that intentions are most reliably predicted by attitudes and self-efficacy. Response-efficacy beliefs may be considered to be positive behavioural beliefs within the context of the TPB and are subsumed by attitudes. Self-efficacy beliefs are determined by perceived controllability and the past engagement in the behaviour of interest. These findings are consistent across at least nine separate health behaviours (i.e., making a quit attempt, using NRT, avoiding situations where the urge to smoke is increased [Study 2], exercising regularly, maintaining a healthy diet [Studies 1, 3 and 4], avoiding foods high in fat, avoiding fast food high in fat, avoiding soft drinks high in sugar and avoiding foods high in sugar [Studies 3 and 4] and two health contexts (smoking and obesity, diet and exercise). However, the residual effect of past behaviour on intentions and current behaviour implies that the models investigated in Studies 1-4 are incomplete accounts of the socio-cognitive predictors of behaviour and behavioural intentions. As such, further predictors may need to be added to these models in order to optimise the prediction of health behaviour. This may be achieved through further studies which employ theoretical integration.

Overarching Implications of Research Program

An overarching implication of the research program presented in this thesis is that none of the existing health behaviour models investigated (i.e., TPB, PMT-R, EPPM Stage Model) represents a complete or adequate explanation of the psychosocial predictors of intentions or behaviour. This is evidenced by variables not included in these models explaining additional variance in intentions and behaviour (cf. Ajzen, 1991; 2002b). Studies 2 and 3 demonstrated that the explanatory power of both the TPB and PMT-R can be improved through the addition of variables such as past behaviour, health knowledge and descriptive norms. The proximal predictors of intentions and behaviour within the EIM resemble the structure of the TPB. However, Study 4 demonstrated that behavioural avoidance explained additional variance in behavioural intentions, and past behaviour explained additional variance in current behaviour after controlling for these TPB predictors. Further, Study 4 showed that susceptibility is associated with defensive message processing of threatening information only under conditions of low self-efficacy; and susceptibility was not associated with adaptive outcomes. These findings are inconsistent with the predictions of the Stage Model – implying that model may also be inadequate. Taken together these results suggest that current models of health behaviour are incomplete and require further development in order to optimise the prediction of health behaviours and intentions.

A further implication of the present research program is that not all health behaviour models are created equal. Some health behaviour models provide better, more accurate, predictions of health behaviours than others. Studies 2 and 3 directly compared the predictions of the TPB and PMT-R, the TPB was almost universally found to be a better approximating model than the PMT-R. The single exception was that the PMT-R was a slightly better approximating model than the TPB for predicting exercise intentions, however the difference between the models was small ($\Delta_i < 4$; Burnham et al., 2004). Taken together this suggests that the TPB should be preferred over PMT-R for predicting quit smoking and dietary intentions, and that either model could be used to predict exercise intentions. These findings show that directly comparing health behaviour models is useful as it highlights which models are most useful for predicting health behaviour intentions. Findings such as these can assist researchers and practitioners in making an informed decision concerning which model to select in order to optimise the prediction of health behaviour intentions.

Unfortunately research suggests that health promotion practitioners often do not incorporate new findings or theory in health behaviour research into their practice. Jones and Donovan (2004) surveyed Australian health promotion practitioners on their knowledge of health behaviour theory and found that most practitioners not aware of several theories (including Protection Motivation Theory and the Theories of Reasoned Action/Planned Behaviour). In fact, the researchers reported that in a small pilot study, participants (who were health promotion practitioners) suggested that the researchers remove some models that they were unaware of, as including them may be confronting and off-putting to the participants – highlighting gaps in their professional knowledge. Interestingly, among these models was Social Learning/Social Cognitive Theory, one of the most cited in the health behaviour literature (Noar et al., 2005). The practioners were most likely to have knowledge of the Transtheoretical Model (Prochaska & DiClemente, 1983; Prochaska et al., 1992), PRECEDE-PROCEED model (Green, 1974); and the Health Belief Model (Becker, 1974; Becker, Drachman, Kirscht, 1974; Rosenstock, 1966), the most recent of which was developed in the early 1980s. Even amongst these ‘popular’ models there were still large proportions of practitioners who were not familiar with them: 34.7% for the Transtheoretical Model, 21.2% for PRECEDE-PROCEED, 23.7% for the Health Belief Model and 41.5% for the Theory of Planned Behaviour. Further, among the models investigated none were used by more than 50% of practitioners in their work. Unfortunately it was not reported how the practitioners used each theory or how many did not apply theory at all in their work. Nevertheless it appears that health promotion practitioners are unaware of contempary health behaviour theory and research and may fail to apply it in their work. This is problematic as it means that new advances in health behaviour research and theory are failing to penetrate; and as a result health promotion practioners may be developing less effective health promotion programs than they would if they were made aware of new findings in the literature (cf. Nutbeam & Harris, 1999).

To this author's knowledge Studies 2 and 3 represented the first studies to utilise model comparison statistics (i.e., AICc values) to directly compare existing health behaviour models. Previous studies which compared health behaviour models generally utilised R^2 values only (e.g., Bish et al., 2000; Garcia et al., 2003; Seydel et al., 1990). R^2 values cannot be used to directly compare non-nested models (Burnham et al., 2002; Mazerolle, 2006). All that can be said when comparing R^2 values is that one model explains more variance than another. This is useful when the differences between the variance explained are large; but when these differences are small there is no statistical test available can be applied to justify the assertion that one model is indeed better than the other. Akaike Information Criterion values also allow for comparison of several models at once. In Studies 2 and 3 the PMT-R and TPB were directly compared with PMT-R and TPB models with additional variables (i.e., health knowledge, past behaviour). This allows for the investigation of whether adding such variables to these models leads to the formation of models which are improvements in terms of explanatory power. Perhaps most importantly the use of model comparison statistics can be used to establish how well each candidate model performs with respect to each of other candidate models. This is useful as it not only highlights which model of a candidate set is the best approximating model, but also specifically to what extent that model is superior to the other candidate models (i.e., how likely is it that Model A is the best of the candidate set). Findings such as these can provide researchers and practitioners with confidence that they are selecting the best possible model (from a candidate set) to predict health behaviour or health behaviour intentions.

Comparison of models is useful within the health behaviour literature as it is characterised by numerous competing models (each with different predictors) which are rarely compared for their accuracy and usefulness in predicting pertinent outcomes (cf. Noar et al., 2005; Chapter 2). The health behaviour literature is therefore fragmented and confusing – there is currently no consensus concerning which health behaviour model is the most accurate. As models are rarely compared such a consensus really cannot be reached on the basis of the available evidence. Direct comparison of health behaviour models may serve several purposes. Most obviously it can identify which models have the better predictive power and which models have relatively poor predictive power. Inferior models should naturally be rejected and fall out of favour within the research community. Such models may be recast and improved in order to ‘compete’ in the marketplace of ideas. Over time research findings should begin to converge on a single model (or set of similar models) which best explains health behaviour. This model could then be used to guide effective health promotion efforts and in turn reduce the burden of preventable disease.

The final overarching implication of the research program presented in this thesis is that integrating ideas from existing health behaviour models can be useful for developing our understanding of the psychosocial determinants of health behaviour. Studies 2 and 3 investigated the predictions of an integrated model which combined the predictions of the TPB and PMT-R. The development of this model led to several new predictions and several unique findings. A consistent relationship between response-efficacy and attitudes was established – attitudes also mediated the effect of response-efficacy on intentions. These findings suggest that response-efficacy may be redundant as a predictor of intentions in models which contain attitudes, as response-efficacy beliefs represent positive behavioural beliefs contributing to the formation of a positive attitude. Self-efficacy was consistently found to be predicted by perceived controllability. The findings of this study lent further validation to findings that self-efficacy is a stronger predictor of intentions than perceived controllability (e.g., Armitage et al., 1999a, 1999b; Hagger et al., 2002; Hagger et al., 2005; Povey et al., 2000a). As such, perceived controllability may be redundant as a predictor of intentions – meaning that individuals' self-efficacy is the only important component of PBC for the prediction of behavioural intentions. These findings show that theoretical integration can be utilised to reduce the redundancy of constructs applied to the prediction of health behaviour within the health behaviour literature (cf. Hagger, 2009, 2010).

Study 4 investigated the predictions of an integrated model which combined the predictions of the TPB, EPPM, Stage Model and RPA. The model made several unique predictions concerning the predictors of several fear appeal outcomes including fear, defensive message responses, fear control responses, attitudes, intentions and behaviour. This study was the first to investigate the predictors of each of these outcomes within a single model. Although many of the predictions of the EIM were not supported, constructs in the EIM were able to predict each of these outcomes – highlighting heretofore undiscovered relationships between constructs of different health behaviour models. These included positive thoughts about the recommendation (Stage Model) being negatively associated with defensive avoidance (EPPM); response-efficacy (EPPM) positively associated with positive thoughts about the recommendation; minimising thoughts (Stage Model) negatively associated with self-efficacy (EPPM). These findings suggest that theoretical integration can be utilised to be able to explain a broader range of pertinent outcomes – thereby increasing the explanatory power of current models (Hagger, 2009, 2010). Theoretical integration can also be utilised to highlight associations between constructs of different health behaviour models. As such, theoretical integration represents a viable means of developing understanding of the psychosocial determinants of health behaviour – as it can lead to the development of new predictions (and new findings), and the development of models which are able to be more broadly applied.

Limitations of the Research Program and Directions for Future Research

The current research program does have some limitations. Firstly the predictions of only two existing models of health behaviour (i.e., TPB and PMT-R) were directly compared. These models were selected as they are relatively popular among researchers (cf. Noar et al., 2005) and contain a number of different constructs and predictions – thereby reducing the potential for redundancy between the models. However, in the short (i.e., incomplete) list of notable models applied to the prediction of health behaviour provided in Chapter 2 (pp. 96-97) there were nineteen models listed. Therefore, the current research program is limited as it only compared two of these nineteen models. Although the TPB was found to be superior to PMT-R for predicting health behaviour intentions (with the exception of exercise), this does not suggest that it should be considered to be superior to any other models of health behaviour. Similar research comparing the predictions of the TPB and other existing models of health behaviour would be necessary to make such a claim. Obviously a larger research program than has been discussed in this thesis would be required to establish which of the existing health behaviour theories provides the most accurate prediction of health behaviour intentions and behaviour (or other pertinent outcomes). Future research could employ similar methodology to that applied in Studies 2 and 3 in order to compare the accuracy of other health behaviour models.

A related limitation of the research program is that in the integrated models developed and tested in this thesis only constructs from two models (in Studies 2 and 3), or four models (in Study 4) were applied. Although these models highlighted associations between constructs of different models and increased the explanatory power of the constituent models, they were by no means comprehensive when compared with the vast array of constructs applied to the prediction of health behaviour. As such, any additional effect of these unobserved constructs remains unknown. Over thirty constructs were identified in the "short list" provided in Chapter 2 (pp. 112); however several more could easily have been identified to further labour the point that there are a dizzying array of constructs applied to the prediction of health behaviour. This suggests that there are several further constructs which could serve as grist for the theoretical integration mill. That is to say that it may be useful to investigate how various constructs applied to the prediction of health behaviour are associated, and whether they can be utilised to improve the prediction of health behaviour over time. A note of caution here though, it would be important to not just continue to aimlessly increase the number of constructs applied to the prediction of health behaviour. The addition of further constructs should have a sound theoretical underpinning. Therefore, researchers should be able to state how the added predictor relates to existing constructs within the model and how it is conceptually distinct from these constructs (cf. Ajzen, 2011). Although the addition of further constructs may have improved the prediction of intentions and behaviour, adding variables to existing theoretical models should be performed cautiously – with sound theoretical reasons for doing so. Nevertheless, research employing theoretical integration could certainly be applied to other health behaviour models than those investigated in this thesis.

A final limitation of this research program is that it focused more heavily on associations between constructs which lead to the formation of an intention to perform a behaviour. There was comparatively little focus on the determinants of behaviour itself. That is the present research may have focussed too heavily on the motivational phase – where the individual forms an intention to engage in a behaviour; and not enough on the volitional stage – where the individual enacts their intentions and maintains the behaviour over time (e.g., Gollwitzer, 1990, 1993, 1996, 1999; Schwarzer, 1992, 2001, 2008). This is likely to be a key reason why the EIM investigated in Study 4 provided much stronger prediction of intentions than behaviour (see Chapter 7). Although health behaviour theory often assumes that the most important predictor of behaviour is intentions (Ajzen, 1991; Fishbein et al., 1975; Rogers, 1975, 1983), this assumption has been called into question (Sheeran, 2002b). Sheeran (2002b) found that intentions explained only 28% of the variance in behaviour on average – suggesting that intentions do not necessarily translate into behaviour. To remedy this, future research may employ constructs which have been found to mediate or moderate the effect of intentions on behaviour such as moral norms (Godin et al., 2005), planning or implementation intentions (Gollwitzer, 1999; Gollwitzer et al., 1998; Sniehotta et al., 2005) and maintenance self-efficacy (Luszcynnska et al., 2003; Sniehotta et al.) to the prediction of health behaviour.

Conclusion

This thesis was designed as an extended argument for the application of methodologies which employ model comparison and theoretical integration within the health behaviour literature. Employing such methodologies is important as the current health behaviour literature is littered with health behaviour models which are rarely compared (Noar et al., 2005). As such, we know little about which models offer better predictions of intentions and behaviour (or other pertinent outcomes) or how constructs from these models are associated with one another. This state of affairs means that the health behaviour literature is fragmented and unlikely to ever converge on a single account of the psychosocial predictors of health behaviour if the current trajectory is followed. Research employing model comparison can ensure that superior models of health behaviour are identified as such, and relatively poor models fall out of favour. Over time this should serve to reduce the number of models applied to the prediction of health behaviour. This will simplify this complex literature and aide health promotion practitioners in effectively navigating it. Theoretical integration can be utilised to hypothesise and test associations between predictors and outcomes within the wider health behaviour literature. This may lead to the development of improved models which are more accurate and able to be more broadly applied than existing health behaviour theories (cf. Hagger, 2009, 2010). Therefore, both model comparison and theoretical integration can be applied to developing understanding of the psychosocial predictors of health behaviour.

The studies described in this thesis have firstly shown that two prominent models of health behaviour: the TPB and PMT-R each offer an incomplete account of the psychosocial predictors of intentions and behaviour. This is evidenced by the finding that constructs not contained in these models explaining additional unique variance (cf. Ajzen, 1991, 2002b). This suggests that these models may need to be reformulated in order to optimise predictions. The TPB was shown to be consistently a much better approximating model for predicting health behaviour intentions across a number of health behaviours (with the exception of exercise intentions). This suggests that model comparison can be utilised to identify superior models from a candidate set of models. Such findings are useful for researchers and practitioners interested in the prediction of health behaviours, as it allows them to make an informed decision concerning which model to apply. Finally, the research program demonstrated that theoretical integration can be utilised to generate new cross-theoretical predictions, highlight associations between constructs from different health behaviour models and explain a broader range of outcomes than any of the constituent models. As such, the research program provided a strong case for the utility of both model comparison and theoretical integration within the health behaviour literature in order to optimise the prediction of health behaviours.

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Appendices

Appendix A: Ethics Approval for Study 1

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

HUMAN RESEARCH ETHICS COMMITTEE

To Chief Investigator or Project Supervisor:	**Doctor Martin Johnson**
Cc Co-investigators / Research Students:	**Miss Jane Wheatley** **Mr Jay Richards** **Ms Jody Blades** **Ms Laura Twyman**
Re Protocol:	**The effect of persuasive media images on risk perception and knowledge retention**
Date:	**17-May-2010**
Reference No:	**H-551-0807**

Thank you for your **Variation** submission to the Human Research Ethics Committee (HREC) seeking approval in relation to a variation to the above protocol.

Variation to:

1. Add Jody Blades and Laura Twyman to the research team as student researchers.

2. Delete Mr Nathan Beehag and Ms Lee Harrison from the research team.

3. Change the status of Mr Jay Richards from an honours to a PhD student researcher.

4. Modify the following components of the questionnaires:
a. Change one of the health contexts from 'breast cancer' to 'diet and exercise';
b. Amend the Demographics Questionnaire;
c. Amend the Knowledge Questionnaire;
d. Change the imagery/text manipulation;
e. Replace the *Beck Anxiety Inventory* with the *Spielberger State Trait Anxiety Inventory*;
f. Add the *Positive and Negative Affect Schedule - Expanded Form (PANAS-X)*;
g. Replace the *Vulnerability Questionnaire* with the *Risk Diagnosis Behaviour Scale (RDBS)* and add a further six items to this scale to measure motivation and desire to change;
h. Amend the Susceptibility Questionnaire and change the title to Peer Comparisons Questionnaire.
i. Add the *Health Anxiety Questionnaire*;
j. Amend the Health Knowledge Questionnaire;
k. Add a Behavioural Intentions questionnaire; and
l. Amend the Time to Follow-up questionnaire.

5. Amend the following study documents to reflect the above:
a. Information Statement - Student (v6, dated 0/05/2010);
b. Consent Form (v3, dated 03/05/2010); and
c. Debrief Sheet (version submitted 12 May 2010).

Your submission was considered under **Expedited** review by the Chair/Deputy Chair.

I am pleased to advise that the decision on your submission is **Approved** effective **14-May-2010**.

The full Committee will be asked to ratify this decision at its next scheduled meeting. A formal *Certificate of Approval* will be available upon request.

PLEASE NOTE AND/OR ACTION THE FOLLOWING:

1. As there was no amended Information Statement/Consent for General Public submitted, it is assumed that future recruitment will be limited to University of Newcastle students. If this is not the case, please ensure the General Public documents are updated and submitted for approval. For noting.

2. Debriefing Sheet.
a. The document submitted with this application varies significantly from the last version approved by the HREC in 2007 and the highlights in no way reflect the major changes which appear to have been implemented prior to this submission. While the document is acceptable, the researchers are reminded that any documentation provided to participants must be approved by the HREC prior to its distribution.
b. Must identify the project supervisor.

3. Amendment to Information Statement and Consent Form.
At the complaints statement, please correct the contact email address to "Human-Ethics@newcastle.edu.au" (ensuring a hyphen is placed between 'Human' and 'Ethics').

Please submit a copy of any revised documents for our records. Associate Professor

Alison Ferguson
Chair, Human Research Ethics Committee

For communications and enquiries:
Human Research Ethics Administration

Research Services
Research Office
The University of Newcastle
Callaghan NSW 2308

T +61 2 492 18999 +61 2 492 18999 FREE
F +61 2 492 17164
Human-Ethics@newcastle.edu.au

Appendix B: Study 1 Information Statement – Psychology Students

FACULTY OF SCIENCE AND INFORMATION TECHNOLOGY

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

INFORMATION STATEMENT **(version 6 - 03/05/2010 - student)**

The Effect of the Media on Health Behaviour

You are invited to participate in the research project identified above. The research is part of Jay Richards Professional Doctorate in Clinical Psychology and Laura Twyman and Jody Blades' Honours studies in Psychology at the University of Newcastle, supervised by Rev Dr. Martin Johnson from the School of Psychology.

Why is the research being done?
The purpose of the research is to examine the effectiveness of the media in changing health behaviour.

Who can participate in the research?
We are looking for volunteers aged over 18 years of age or are enrolled in a University of Newcastle program.

What will you be asked to do?
This study has two parts:

The first part involves you coming to AVLG 20 in the Aviation Building at the University of Newcastle Callaghan Campus; there you will be asked to complete a demographics questionnaire and a knowledge questionnaire regarding a number of health issues. This will be followed by a short presentation of images or a text. This may focus on possible consequences of unhealthy behaviour or may have no relevance to health; in this case the images and text will have landscapes as the focus. You will then be asked to complete a number of short questionnaires and an additional knowledge questionnaire.

If you agree to continue your participation; the second part of the research will consist of a postal survey one month following Part 1. For this we will send you a second version of some of the questionnaires that you completed in Part 1 of the research. This is to see if there have been any changes since your participation in Part 1.
How much time will it take?
The first part of the research will take about ninety minutes to complete.
Part two should take a maximum of 20 minutes.
What are the risks and benefits of participating?
The benefit of completing this research is the attainment of course credit for PSYC 1010 or PSYC1020. For participation in Part 1 you will receive 3 points (1.5%) of course credit. If you choose to continue your participation, Part 2 will entitle you to an additional 1 point (0.5%) of course credit.
You will also gain first hand experience of research approaches and methods used in psychology.
Although there are no known risks in participating in this type of research, participants can potentially find some questionnaires regarding health distressing, as they may raise issues

about your own health status. If you are concerned about any of the health issues raised in this study, please contact your local GP. If you feel distressed at any time during the study please remember that you are able to withdraw at any time; also you can contact the University Counselling Service on 49215801 or Lifeline 131114.

How will your privacy be protected?

Any information collected by the researchers will be stored securely in a locked cupboard and only accessible to the researchers. A code will appear on the front cover of the questionnaires. Only you and the researcher will have access to the code and it will only be used to help us to know that Part 1 and Part 2 questionnaires belong to the same person. The rating sheets are de-identified to ensure anonymity.

Data will be retained for 5 years following submission of Jay Richards' PhD thesis, at the University of Newcastle. Confidentiality of your data will be ensured by assigning each participant a number at the outset of the experiment. This will be placed on all of your response sheets so we can match your two responses up. The number list will be stored separately from the response sheets and all paper copies of responses will be shredded at the completion of the study.

How will the information collected be used?

The data collected may be presented at academic conferences and may also be used as part of papers published in a scientific journal, but your anonymity will be preserved at all times and only aggregated data will be reported. The data will also contribute to the honours student's and the PhD student's theses.

You will have the option of leaving your email address with the researcher if you would like to be

provided with a brief overview of the results of the study once it is complete.

What choice do you have?

Participation in this research is voluntary. Only those people who give their informed consent will be included in the project. If you do decide to participate, you may withdraw from the project at any time without giving a reason and have the option of withdrawing any data, which may identify you.

What do you need to do to participate?

If having read this Information Statement you would like to participate please read and complete the Consent Form and return to the researchers. If there is anything you do not understand, or you have questions, please ask the researcher for clarification.

Thank you for considering participating in this study. If you are interested in participating or would like further information please contact Jay Richards at Jay.Richards@uon.edu.au

Rev Dr Martin P. Johnson
BSc (Hons) MSc PGC(H)E PhD MAPS CPsychol AFBPsS
Registered Psychologist PS0102241
Senior Lecturer
Phone: +61 2 4921 8864 Fax: +61 2 4921 6980
Email: martin.johnson@newcastle.edu.au

Jay Richards
PhD Student

Laura Twyman
Honours Student

Jody Blades
Honours Student

Complaints about this research: This project has been approved by the University's Human Research Ethics Committee, Approval No. H-551-0807 Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au

Appendix C: Study 1 Information Statement – General Public

FACULTY OF SCIENCE AND INFORMATION TECHNOLOGY

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

INFORMATION STATEMENT - GENERAL PUBLIC (version 1 - 11/08/2010 – general public)

The Effect of the Media on Health Behaviour

You are invited to participate in the research project identified above. The research is part of Jay Richards Professional Doctorate in Clinical Psychology and Laura Twyman and Jody Blades' Honours studies in Psychology at the University of Newcastle, supervised by Rev Dr. Martin Johnson from the School of Psychology, and co-supervised by Dr. Andrew Rutherford from the School of Psychology, Keele University, Staffordshire, UK.

Why is the research being done?
The purpose of the research is to examine the effectiveness of the media in changing health behaviour.

Who can participate in the research?
We are looking for volunteers aged over 18 years of age or are enrolled in a University of Newcastle program.

What will you be asked to do?
This study has two parts:
The first part involves you either coming to AVLG 20 in the Aviation Building at the University of Newcastle Callaghan Campus; there you will be asked to complete a demographics questionnaire and a knowledge questionnaire regarding a number of health issues. This will be followed by a short presentation of images or a text. This may focus on possible consequences of unhealthy behaviour or may have no relevance to health; in this case the images and text will have landscapes as the focus. You will then be asked to complete a number of short questionnaires and an additional knowledge questionnaire.
If you agree to continue your participation; the second part of the research will consist of a postal survey one month following Part 1. For this we will send you a second version of some of the questionnaires that you completed in Part 1 of the research. This is to see if there have been any changes since your participation in Part 1.

How much time will it take?
The first part of the research will take about ninety minutes to complete.
Part two should take a maximum of 20 minutes.
What are the risks and benefits of participating?
Although we cannot promise any personal benefit from your participation, one potential benefit is that you will gain first hand experience of research approaches and methods used in psychology.
Although there are no known risks in participating in this type of research, participants can potentially find some questionnaires regarding health distressing, as they may raise issues about your own health status. If you are concerned about any of the health issues raised in this study, please contact your local GP. If you feel distressed at any time during the study

please remember that you are able to withdraw at any time; also you can contact the University Counselling Service if you are a student of the University of Newcastle on 49215801 or Lifeline 131114.

How will your privacy be protected?
Any information collected by the researchers will be stored securely in a locked cupboard and only accessible to the researchers. A code will appear on the front cover of the questionnaires. Only you and the researcher will have access to the code and it will only be used to help us to know that Part 1 and Part 2 questionnaires belong to the same person. The rating sheets are de-identified to ensure anonymity.
Data will be retained for 5 years following submission of Jay Richards' PhD thesis, at the University of Newcastle. Confidentiality of your data will be ensured by assigning each participant a number at the outset of the experiment. This will be placed on all of your response sheets so we can match your two responses up. The number list will be stored separately from the response sheets and all paper copies of responses will be shredded at the completion of the study.

How will the information collected be used?
The data collected may be presented at academic conferences and may also be used as part of papers published in a scientific journal, but your anonymity will be preserved at all times and only aggregated data will be reported. The data will also contribute to the honours student's and the PhD student's theses.

You will have the option of leaving your email address with the researcher if you would like to be provided with a brief overview of the results of the study once it is complete.

What choice do you have?
Participation in this research is voluntary. Only those people who give their informed consent will be included in the project. If you do decide to participate, you may withdraw from the project at any time without giving a reason and have the option of withdrawing any data, which may identify you.

What do you need to do to participate?
If having read this Information Statement you would like to participate please read and complete the Consent Form and return to the researchers. If there is anything you do not understand, or you have questions, please ask the researcher for clarification.

Thank you for considering participating in this study. If you are interested in participating or would like further information please contact Jay Richards at Jay.Richards@uon.edu.au

Rev Dr Martin P. Johnson
BSc (Hons) MSc PGC(H)E PhD MAPS CPsychol AFBPsS
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Jay Richards
PhD Student

Laura Twyman
Honours Student

Jody Blades
Honours Student

Complaints about this research: This project has been approved by the University's Human Research Ethics Committee, Approval No. H-551-0807 Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au

Appendix D: Study 1 Consent Form

FACULTY OF SCIENCE AND INFORMATION TECHNOLOGY

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

ID _ _ _ _

CONSENT FORM

The Effect of the Media on Health Behaviour

Version 3- 03/05/2010

I have been invited to participate in the above named research project being conducted by Jay Richards, Laura Twyman and Jody Blades under the supervision of Rev Dr. Martin Johnson (School of Psychology). I have read the information sheet for this study and I consent to participate.

By signing this form, I agree that:

1. I am aware that all the information gathered would be used for research purposes only. I understand that my personal information will remain confidential to the researchers.
2. I understand that only the researchers associated with this research will have access to the data collected and the data will be stored in a locked cabinet for a period of 5 years.
3. I understand that my participation is voluntary and that I am free to withdraw at any time or decline to answer any questions that I choose
4. Questionnaires will be carried out as described in the information sheet, a copy of which I have retained
5. I understand I will be viewing a short presentation, or text will be given, as described in the information sheet.
6. I have had all my questions answered to my satisfaction.

Name: ………………………………………………….

Signature: …………………………….. Date: ……/……/2010

Enquiries about the study may be directed to Rev Dr. Martin Johnson, School of Psychology, Faculty of Science and Information Technology, The University of Newcastle, telephone: 49218864 or Martin.Johnson@newcastle.edu.au.

In order for us to send you the one-month follow-up questionnaires by mail, please supply your name and address below:

Name: ________________________________ Address: _____________________________________

❒ Please ✓ and add your email address if you wish to receive a summary of the results of this research

Email: _______________________________________

Rev Dr Martin P. Johnson
BSc (Hons) MSc PGC(H)E PhD MAPS CPsychol AFBPsS
Registered Psychologist PS0102241
Senior Lecturer
Phone: +61 2 4921 8864
Fax: +61 2 4921 6980
Email: martin.johnson@newcastle.edu.au

Appendix E: Study 1 Debrief Sheet

FACULTY OF SCIENCE AND INFORMATION TECHNOLOGY

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

The Effect of the Media on Health Behaviour

Project Supervisor: Rev. Dr. Martin P. Johnson
Research Team: Jay Richards, Laura Twyman, and Jody Blades

Thank you for your participation in this project.

The aim of this study was to investigate the effect persuasive imagery has on knowledge retention for health related information. We hope that our findings will help us to better understand this effect.

You will have been assigned to one of three health contexts: skin cancer, smoking related illness or diet and exercise. Within each of these health contexts there were three conditions. A control condition in which participants will have been exposed to benign imagery unrelated to health. A mild condition where participants were exposed to mild images/text relating to either skin cancer, smoking related illness or diet and exercise. And a persuasive condition where participants were exposed to persuasive images/text of skin cancer, smoking related illness or diet and exercise.
The first knowledge questionnaire was designed to give you information about either skin cancer, smoking related illness or diet and exercise and general health. The final health questionnaire assessed your retention of the information presented to you in the first knowledge questionnaire. We hypothesise that participants in the persuasive condition will perform more poorly on the final health questionnaire than those in the mild and control conditions. The non-disclosure of our aims was necessary to ensure the validity of our study.
The other measures measured your level of general and health anxiety following media exposure, coping style, affect (mood), perceived vulnerability/susceptibility to skin cancer, smoking related illness or unhealthy diet and exercise, and the degree to which you actively protect yourself in regard to the health issue which was the focus of the part of the study you participated in. We asked for this information so we can further investigate whether some/all of these factors contribute to a person’s knowledge retention for health relevant information and to investigate whether the presentation of graphic images/text had any effect on these factors.
This experiment was designed to minimise the potential for any harm to your person. However, if you feel that this study has adversely affected you in any way please feel free to speak to the researchers at the completion of the study, contact us on the email address below or contact the University Counselling Service on 49215801 or Lifeline on 131114. If you are concerned about any health issues raised in this study we strongly urge you to contact your GP.

Thank you again for your time.

Kind Regards

Jay Richards (Jay.Richards@uon.edu.au) Rev. Dr Martin Johnson (Martin.johnson@newcastle.edu.au)

Complaints about this research This project has been approved by the University’s Human Research Ethics Committee, Approval No. H-551-0807 Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au

Appendix F: Study 1 Recruitment Poster

FACULTY OF SCIENCE AND INFORMATION TECHNOLOGY

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

The Effect of the Media on Health Behaviour.

You are invited to participate in the research project identified above. The research is part of Jay Richards' Professional Doctorate in Clinical Psychology and Laura Twyman and Jody Blades' Honours studies in Psychology at the University of Newcastle, supervised by Rev Dr. Martin Johnson from the School of Psychology, and co-supervised by Dr. Andrew Rutherford from the School of Psychology, Keele University, Staffordshire, UK.

Why is the research being done?
The purpose of the research is to examine the effectiveness of the media in changing health behaviour.

Who can participate in the research?
We are looking for volunteers aged over 18 years of age or who are enrolled in a University of Newcastle program.
What will you be asked to do?
This study has two parts:

The first part involves you coming to AVLG 20 in the Aviation Building at the University of Newcastle Callaghan Campus; there you will be asked to complete a demographics questionnaire and a knowledge questionnaire regarding a number of health issues. This will be followed by a short presentation of images or text. This may focus on possible consequences of unhealthy behaviour or may have no relevance to health; in this case the images and text will have landscapes as the focus. You will then be asked to complete a number of short questionnaires and an additional knowledge questionnaire.
If you agree to continue your participation; the second part of the research will consist of a postal survey one month following Part 1. For this we will send you a second version of some of the questionnaires that you completed in Part 1 of the research. This is to see if there have been any changes since your participation in Part 1.
How much time will it take?
The first part of the research will take about ninety minutes to complete.
Part two should take a maximum of 20 minutes.
Thank you for considering this invitation to participate in this study.
If you are interested in participating or have any questions regarding this project please email Jay Richards at Jay.Richards@newcastle.edu.au

Complaints about this research
This project has been approved by the University's Human Research Ethics Committee, Approval No. H-551-0807
Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au.

Appendix G: Study 1 Booklet Cover Page

OBG _ _ _ _

FACULTY OF SCIENCE AND
INFORMATION TECHNOLOGY

THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

The Effect of the Media on Health Behaviour

Study under the supervision of Rev Dr Martin Johnson
Researchers:
Jay Richards
Laura Twyman
Jody Blades

Thank you for your decision to participate in this study.

In this booklet are a number of questionnaires. Please read each question or statement carefully and provide your response as indicated.

All responses will be kept strictly confidential and your identity will remain unknown to anyone outside of the research team.

For more information please email:

Jay.Richards@uon.edu.au

Complaints about this research
This project has been approved by the University's Human Research Ethics Committee, Approval No. H-551-0807 Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au

Appendix H: Study 1 Threat Manipulations

Benign

Personal Account

The day started with breakfast in the garden restaurant at the Springlands Hotel just outside of Moshi, followed by our final showers for days; if the solitary trickle of water, backed drain and ensuing flooded room can justifiably be called a shower!

Our guide, Hamisi Nteze, arrived and we, and our belongings were loaded into a ramshackle bus, along with several other trekkers, guides, porters and cooks, stopping several times along the way for groceries and last minute items. Turning off on the final road to Machame Gate, we passed by the lush vegetation and private homes, all the while being coated in a thin film of red dust, as it seeped in through the crevices of the bus, filling our nostrils and lungs.

We were fed a box lunch consisting of white buns, cakes, bananas, oranges, and fruit juice and, with this fortification in our bellies, set out around noon, for the start of the big climb! We were suppose to have a private climb, but were grouped with Carmen from Toronto, Matt, James, and Crystal from New Zealand, and Hannah from England; all engaging and quite comical. We couldn't have asked for a better group with whom to summit.

We climbed for about 6 hours through intense heat and under cover of the rain forest, arriving at our camp, amidst the rain, which was to become our constant companion. Our tents had been set up, as well as a dining tent, in which we were treated to hot tea and Milo (a cocoa-like vitamin-rich powder) and popcorn. Kerri and Ryan took advantage of the plethora of baby wipes bestowed on them by Ryan's good friend, in order to have their first of many 'showers' along the way.

About an hour later, we were called back to the dining tent, where we were served cucumber soup, the ubiquitous white bread, followed by fried fish, potatoes, and a vegetable sauce. We drank some more hot water, hydration being the number one saviour when coping with altitude sickness, chatted with our new friends, got the briefing about what awaited us the following day, and then headed to our tent for bed, where we bundled up in several layers of clothing, and encased ourselves in our sleeping bags, attempting to stave off the cold.

We couldn't get over quite how 'pole pole' (slowly) we were forced to walk all day, but obviously the experts knew best! Nteze, our guide, has summated more than 25 times! The porters were incredible to watch. They are veritable workhorses, each carrying approximately 25 kilos on their heads and backs, going to great lengths to take everything up the mountain that will ensure our utmost comfort while at the daily camps.

As we looked out from our little clearing at camp, we all marvelled at the sky tonight, so rife with stars it resembled a planetarium.

Moderate Threat

Obesity Personal Account

Hello, I’m currently living in Melbourne, Australia, although I did not grow up here. I’m 5 foot 3 inches and weigh 107kg. As bad as that sounds, it’s not my heaviest. A few years ago I weighed 116kg. My health is suffering because of the weight. I’m diabetic, have high blood pressure and I’m tired all the time.

My story might be a little diferent than some. I didn’t start out life heavy. I was a skinny, sickly child. Averae sized until somewhere between 35 and 40. I am now 54. I gained weight slowly but surely. Maybe five kilos a year. Nothing obvious. Just taking in more calories and not exercising enough. I blame it on not having to watch what I ate.

I never learned to eat properly to maintain my weight. My childhood was filled with “eat something you’ll feel better.” Now whenever I feel neglected, or get angry, or sad, or... I eat something, to feel better.

I have made my mind up. I am going to get the weight off for good.

I refuse to pay anyone my hard-earned money to help me do this. I went on the internet and got a diet plan mapped out for me and so far I have lost 3kg. I have also started going to my local pool and taken up water-walking. I don’t swim, I water walk. I walk through the water just like I would walk on a sidewalk.

I can’t believe I have let myself get to this point but I don’t plan to be here long.

High Threat

Obesity Personal Account

OK, I am an overweight person, I’ll say that straight out. I am even obese. I have not always been this way. A few years ago when I was 18, I used to be thin and of normal weight.

My mum has been heavy ALL of her life. Since I was born, she was always the “fat one” in the family. I don’t think she ever thought it was possible to lose weight and maintain a healthy weight permanently. She tried diets, I remember it. She would lose some weight, and then stop dieting and gain it back. Eventually, she gained so much weight that walking became difficult (from weak and painful knees). Then more weight crept on and she became diabetic. Then she got congestive heart failre (which comes and goes and is controlled by medication and hospital visits). Diabetes gave her complications. When her blood sugar drops she has to be rushed to the hospital. Her

heart worked too hard, and she ended up with an irregular rhythm and needed a pacemaker. Now she has lost her eyesight from the diabetes.
Thins kept going downhill. Mum had to have her right foot amputated because of her poor circulation. She is too heav to use crutches, so she can't get out of her bed without help. She often soils herself and can't clean herself up until someone comes to help her. She is covered in weping bed sores from constantly lying in bed. When she falls out of bed, se cannot get up. The ambulance crew has to come and hoist her up and heave her back into bed. She also suffers from incontinency and sleep apnoea. She stops breathing in her sleep and needs a face mask to help her breathe.

Every day of her life, since I was a child, has been filled with depression and hopelessness. Mum has lost her joy over the years and can't stand to look at herself in the mirror. I cannot imagine her pain nor do I ever want to know it. I am so scared for her life.

This is just terrible! It is so sad that all this happened to her. But the really sad thing is that it happened so slowly. There were so many points where she could have changed her habits and tried harder.

My mum is only 50 yeas old, and she is about to become a grandma in about four and a half months and I am so scared that she might no make it to se my little girl.

Life is so lonely when you are obese. People mock obesity and think it isn't a real disease, but they are wrong! I have seen its effects for so long and I have felt them. I know what it does to a person's health and mental wellbeing. I guess I am learning to take it one day at a time and to ake sure every day that my mum knows I love her. I simply cannot imagine my life without her.

Appendix I: Study 1 Measures

Demographics

1. Sex ❐ Female ❐ Male (please ✓)
2. In which year were you born _ _ _ _ (please specify)
3. Approximately what is your height in centimetres? __________ cm
4. Approximately what is your weight in kilograms? _________ kg

Knowledge Questionnaire

Please circle 1 to 9 along the scale below indicating how <u>certain</u> you are that each statement is either true or false.

Scale:

1. I am 100% certain this statement is FALSE
5. I definitely don't know whether this statement is true or false
9. I am 100% certain this statement is TRUE

It is important that you only circle 1 or 9 if you are <u>100% certain</u> that this item is false or true. It is important that you are honest about your level of certainty. If you are unsure of whether a statement is true or false, please circle the 5 on the scale.

CERTAIN IT'S FALSE DON'T KNOW CERTAIN IT'S TRUE

1 2 3 4 5 6 7 8 9

1. The recommended daily intake of fruit is 2 servings 1 2 3 4 5 6 7 8 9
2. You can reduce your chances of becoming obese by exercising at least 30 mins per day 1 2 3 4 5 6 7 8 9
3. For obese women, there is an increased risk of miscarriage during pregnancy 1 2 3 4 5 6 7 8 9
4. The recommended daily intake of meat, poultry, fish, dry beans, or nuts is 1 serving 1 2 3 4 5 6 7 8 9
5. For obese women, there is an increased risk of

gestational diabetes during pregnancy 1 2 3 4 5 6 7 8 9

6. For obese women, there is an increased risk of pregnancy-induced hypertension 1 2 3 4 5 6 7 8 9

7. The recommended daily intake of milk, yoghurt, or cheese is 2 servings 1 2 3 4 5 6 7 8 9

8. The recommended daily intake of vegetables is 5 servings 1 2 3 4 5 6 7 8 9

9. For obese women, there is an increased risk of pre-eclampsia during pregnancy 1 2 3 4 5 6 7 8 9

10. Obesity is associated with the development of osteoarthritis 1 2 3 4 5 6 7 8 9

11. The life expectancy of an overweight or obese person can be shortened by 3 to 10 years 1 2 3 4 5 6 7 8 9

12. The recommended daily intake of bread, cereal, rice, or pasta is 4 servings 1 2 3 4 5 6 7 8 9

13. If you are overweight, losing 5% of your body weight can lower your risk for several diseases 1 2 3 4 5 6 7 8 9

Health Knowledge Questionnaire

Please answer each of the questions below using the spaces provided. Please attempt every question. From this point onwards, it is important that you <u>do not</u> turn back to previous sections in this booklet.

1. Please list 4 things you can do to reduce your risk of Type 2 Diabetes:*

____

____

____

____

2. If you are overweight, losing as little as ______% of your body weight

can lower your risk for several diseases.

3. What is the recommended daily intake of the following food groups:

Fruit: _______________ serving(s)

Vegetables: _______________ serving(s)

Bread, Cereal, Rice, Pasta: _______________ serving(s)

Milk, Yoghurt, Cheese: _______________ serving(s)

Meat, Poultry, Fish, Dry Beans, Nuts: _______________ serving(s)

4. Obesity increases the chances of developing which type of liver disease?*

_________________________ liver disease

5. Currently in Australia, there are estimated to be 67% overweight or obese men and ______% overweight or obese women.*

6. How many minutes per day should a person exercise to reduce their chances of developing health problems?*

At least _____________ minutes

7. Please list 4 pregnancy-related problems that are associated with obesity:

____

____

____

____

8. Obesity is associated with the development of which type of arthritis?

____

9. Heart disease is _______% more common in people who are obese.*

10. The life expectancy of an overweight or obese person can be shortened by ______ to ______ years.

11. Approximately _______% of Australian adults are currently overweight or obese.*

Note: * = Items which do not correspond to information presented in the knowledge questionnaire (see above).

Protection Motivation Theory Constructs

Each of the Protection Motivation Theory Constructs (susceptibility, severity, response-efficacy, self –efficacy and costs) and behavioural intentions had the following instructions:

Using the scale below, please circle the number which best describes how much you agree with each of the following statements.

Scale:
1. Strongly Disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly Agree

Susceptibility

It is likely that I will get weight related health problems	1	2	3	4	5
I am at risk for getting weight related health problems	1	2	3	4	5
It is possible that I will get weight related health problems	1	2	3	4	5

Severity

I believe that weight related health problems are severe	1	2	3	4	5
I believe that weight related health problems have serious negative consequences	1	2	3	4	5
I believe that weight related health problems are extremely harmful	1	2	3	4	5

Response-Efficacy – Exercise

Regular exercise is effective in preventing weight related health problems	1	2	3	4	5
Regular exercise works in preventing weight related health problems	1	2	3	4	5

If I do regular exercise I am less likely to get weight related health problems	1 2 3 4 5

Response-Efficacy – Healthy Diet

Maintaining a healthy diet is effective in preventing weight related health problems	1 2 3 4 5
Maintaining a healthy diet works in preventing weight related health problems	1 2 3 4 5
If I maintain a healthy diet, I am less likely to get weight related health problems	1 2 3 4 5

Self-Efficacy – Exercise

I am able to do regular exercise to prevent getting weight related health problems	1 2 3 4 5
I have the skill time and money to do regular exercise to prevent weight related health problems	1 2 3 4 5
I can easily do regular exercise to prevent weight related health problems	1 2 3 4 5

Self-Efficacy – Healthy Diet

I am able to maintain a healthy diet to prevent getting weight related health problems	1 2 3 4 5
I have the skills, time and money to maintain a healthy diet to prevent getting weight related health problems	1 2 3 4 5
I can easily maintain a healthy diet to prevent weight related health problems	1 2 3 4 5

Costs - Exercise

The benefits of regular exercise outweigh the difficulties associated with exercising regularly 1 2 3 4 5

Costs – Healthy Diet

The benefits of maintaining a healthy diet outweigh the difficulties associated with maintaining a healthy diet 1 2 3 4 5

Intentions – Exercise

I believe I will do regular exercise to prevent weight related health problems 1 2 3 4 5

I am motivated to do regular exercise to prevent weight related health problems 1 2 3 4 5

How likely is it that you will engage in regular exercise?

Very Unlikely Unlikely Neutral Likely Very Likely

Intentions – Healthy Diet

I believe I will maintain a healthy diet to prevent weight related health problems 1 2 3 4 5

I am motivated to maintain a healthy diet to prevent weight related health problems 1 2 3 4 5

How likely is it that you will maintain a healthy and balanced diet?

Very Unlikely Unlikely Neutral Likely Very Likely

Fear

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way *right now*. Use the following scale to record your answers:

1. Very slightly or not at all
2. A little
3. Moderately
4. Quite a bit
5. Extremely

Afraid	1	2	3	4	5
Scared	1	2	3	4	5
Frightened	1	2	3	4	5
Nervous	1	2	3	4	5
Jittery	1	2	3	4	5
Shaky	1	2	3	4	5

Appendix J: Ethics Approval for Study 2

HUMAN RESEARCH ETHICS COMMITTEE

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

Notification of Expedited Approval

To Chief Investigator or Project Supervisor:	**Doctor Martin Johnson**
Cc Co-investigators / Research Students:	**Mrs Jodie Poole** **Mr Jay Richards** **Dr Andrew Rutherford**
Re Protocol:	**Improving the Predictive and Explanatory Power of Fear Appeal Theory II: A Further Case for Theoretical Integration**
Date:	**28-Aug-2012**
Reference No:	**H-2012-0245**
Date of Initial Approval:	**28-Aug-2012**

Thank you for your **Response to Conditional Approval** submission to the Human Research Ethics Committee (HREC) seeking approval in relation to the above protocol.

Your submission was considered under **Expedited** review by the Chair/Deputy Chair.

I am pleased to advise that the decision on your submission is **Approved** effective **28-Aug-2012**.

In approving this protocol, the Human Research Ethics Committee (HREC) is of the opinion that the project complies with the provisions contained in the National Statement on Ethical Conduct in Human Research, 2007, and the requirements within this University relating to human research.

Approval will remain valid subject to the submission, and satisfactory assessment, of annual progress reports. *If the approval of an External HREC has been "noted" the approval period is as determined by that HREC.*

The full Committee will be asked to ratify this decision at its next scheduled meeting. A formal *Certificate of Approval* will be available upon request. Your approval number is **H-2012-0245**.

If the research requires the use of an Information Statement, ensure this number is inserted at the relevant point in the Complaints paragraph prior to distribution to potential

participants You may then proceed with the research.

Conditions of Approval

This approval has been granted subject to you complying with the requirements for *Monitoring of Progress*, *Reporting of Adverse Events*, and *Variations to the Approved Protocol* as detailed below.

PLEASE NOTE:
In the case where the HREC has "noted" the approval of an External HREC, progress reports and reports of adverse events are to be submitted to the External HREC only. In the case of Variations to the approved protocol, or a Renewal of approval, you will apply to the External HREC for approval in the first instance and then Register that approval with the University's HREC.

- ***Monitoring of Progress***

Other than above, the University is obliged to monitor the progress of research projects involving human participants to ensure that they are conducted according to the protocol as approved by the HREC. A progress report is required on an annual basis. Continuation of your HREC approval for this project is conditional upon receipt, and satisfactory assessment, of annual progress reports. You will be advised when a report is due.

- ***Reporting of Adverse Events***

1. It is the responsibility of the person **first named on this Approval Advice** to report adverse events.
2. Adverse events, however minor, must be recorded by the investigator as observed by the investigator or as volunteered by a participant in the research. Full details are to be documented, whether or not the investigator, or his/her deputies, consider the event to be related to the research substance or procedure.
3. Serious or unforeseen adverse events that occur during the research or within six (6) months of completion of the research, must be reported by the person first named on the Approval Advice to the (HREC) by way of the Adverse Event Report form within 72 hours of the occurrence of the event or the investigator receiving advice of the event.
4. Serious adverse events are defined as:
    - Causing death, life threatening or serious disability.
    - Causing or prolonging hospitalisation.
    - Overdoses, cancers, congenital abnormalities, tissue damage, whether or not they are judged to be caused by the investigational agent or procedure.
    - Causing psycho-social and/or financial harm. This covers everything from perceived invasion of privacy, breach of confidentiality, or the diminution of social reputation, to the creation of psychological fears and trauma.
    - Any other event which might affect the continued ethical acceptability of the project.
5. Reports of adverse events must include:
    - Participant's study identification number;
    - date of birth;

    - date of entry into the study;
    - treatment arm (if applicable);
    - date of event;
    - details of event;
    - the investigator's opinion as to whether the event is related to the research procedures; and
    - action taken in response to the event.
6. Adverse events which do not fall within the definition of serious or unexpected, including those reported from other sites involved in the research, are to be reported in detail at the time of the annual progress report to the HREC.

- ***Variations to approved protocol***

If you wish to change, or deviate from, the approved protocol, you will need to submit an *Application for Variation to Approved Human Research*. Variations may include, but are not limited to, changes or additions to investigators, study design, study population, number of participants, methods of recruitment, or participant information/consent documentation. **Variations must be approved by the (HREC) before they are implemented** except when Registering an approval of a variation from an external HREC which has been designated the lead HREC, in which case you may proceed as soon as you receive an acknowledgement of your Registration.

Linkage of ethics approval to a new Grant

HREC approvals cannot be assigned to a new grant or award (ie those that were not identified on the application for ethics approval) without confirmation of the approval from the Human Research Ethics Officer on behalf of the HREC.

Best wishes for a successful project.

Professor Allyson Holbrook

Chair, Human Research Ethics Committee

For communications and enquiries:

Human Research Ethics Administration

Research Services
Research Integrity Unit
HA148, Hunter Building
The University of Newcastle
Callaghan NSW 2308

T +61 2 492 18999 +61 2 492 18999 FREE
F +61 2 492 17164
Human-Ethics@newcastle.edu.au

Appendix K: Study 2 Information Statement – Psychology Students

FACULTY OF SCIENCE AND INFORMATION TECHNOLOGY

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

INFORMATION STATEMENT - SONA

(version 2 – 14/08/2012)

The Effect of the Media on Health Behaviour

You are invited to participate in the research project identified above. The research is part of Jay Richards PhD (Clinical Psychology) at the University of Newcastle. The research is supervised by Rev Dr. Martin Johnson from the School of Psychology, and co-supervised by Dr. Andrew Rutherford from the School of Psychology, Keele University, Staffordshire, UK.

Why is the research being done?
The purpose of the research is to examine the effectiveness of the media in changing health behaviour.

Who can participate in the research?
We are looking for volunteers who are current tobacco smokers and aged 18 years or over (or are enrolled in a University of Newcastle program) and have a conversational level of English.

What will you be asked to do?
This study is comprised of a number of questionnaires. If you agree to participate you will be asked to complete questionnaires at three time points. The questionnaires will ask you about some of your current health behaviours and how vulnerable you may or may not feel about illness. The context for most of the questions will be around the negative health consequences associated with tobacco smoking.

In Part 1 of the study you will be asked to complete a series of questionnaires, that will ask questions about you, your current health behaviours and examine your knowledge about the negative consequences associated tobacco smoking together with your understanding of risk. If you choose to participate in this online study the questionnaires and instructions are available if you click the “Start Survey” button below. Here you will find full instructions on how to consent and participate in the research.

Part 2 of the study must be completed one week following completion of Part 1. Part 2 questionnaires are also available at this SONA page and can be accessed by clicking the “Start Survey” button below when you access this study for a second time, again full instructions will be provided on how to complete the questionnaires.

In Part 2 you will be asked to read a body of text and view images relating to the negative health consequences of tobacco smoking. After reading the text you will be asked to complete a number of short questionnaires regarding your attitudes and beliefs around your tobacco smoking. On completion of these questionnaires you will be again invited to indicate your willingness to participate in Part 3 of the research. You are under no obligation to continue your participation.

One month following your participation in Part 2 of the study you will be invited to participate in Part 3. You will be invited to complete the Part 3 questionnaire which is also available at this SONA page and can be accessed by clicking the “Start Survey” button below when you access this study for a third time. Again full instructions will be available at this website. The Part 3 questionnaires will examine your current attitudes and behaviour in relation to tobacco smoking.

How much time will it take?
Part 1 should take a maximum of fifty minutes to complete.
Part 2 should take a maximum of eighty minutes to complete.
Part 3 should take a maximum of fifty minutes to complete.

What are the risks and benefits of participating?
If you are enrolled in PSYC1010 or PSYC1020 you can attain course credit for your participation in this research. For participation in Part 1 you will receive 2 points (2%) of course credit. If you choose to continue your participation, Part 2 will entitle you to an additional 3 points (3%) of course credit. If you choose to further continue your participation to Part 3 you can receive an additional 2 points (2%) of course credit. You will also gain first hand experience of research approaches and methods used in psychology.

Although there are no known risks in participating in this type of research, participants can potentially find some questionnaires regarding health distressing. Some participants may also find the information and images contained in Part 2 of the research distressing as they may raise issues about their own health status. If you are concerned about any of the health issues raised in this study, please contact your local GP. If you feel distressed at any time during the study please remember that you are able to withdraw at any time; also you can contact Lifeline on 131114 or the University Counselling Service on 49215801.

How will your privacy be protected?
Any information collected by the researchers will be stored securely in a locked cupboard and only accessible to the researchers. You will be assigned a unique code, only you and the researcher will have access to this code and it will only be used to help us to identify that Part 1, Part 2 and Part 3 questionnaires belong to the same person. Data will be retained for a minimum of 5 years following submission of Jay Richards’ PhD thesis, at the University of Newcastle.

How will the information collected be used?
The data collected will be presented at academic conferences and be used as part of papers published in scientific journals, but your anonymity will be preserved at all times and only aggregated data will be reported. The data will also contribute to the PhD student’s theses. You will have the option of leaving your email address with the researcher if you would like to be provided with a brief overview of the results of the study once it is complete.

What choice do you have?
Participation in this research is voluntary. Only those people who give their informed consent will be included in the project. If you do decide to participate, you may withdraw from the project at any time without giving a reason or incurring penalty and have the option of withdrawing any data, which may identify you.

What do you need to do to participate?
For SONA participants please follow the links provided on the SONA website to consent to participate and complete the questionnaires as instructed. For non-SONA participants, if having read this Information Statement you would like to participate then please go to http://psych.newcastle.edu.au/smoking where you will be provided with full instructions on how to participate.

If there is anything you do not understand, or you have questions, please feel free to contact the researchers for clarification.

Thank you for considering participating in this study. If you would like further information please contact Jay Richards at Jay.Richards@newcastle.edu.au or phone Jay Richards on 49 215 910.

Rev. Dr Martin P. Johnson
BSc (Hons) MSc PGC(H)E PhD MAPS CPsychol AFBPsS
Registered Psychologist PSY0001388031
Senior Lecturer

Dr Andrew Rutherford
Senior Lecturer

Jay Richards
PhD Student

Jodie Poole
Research Assistant

Phone: +61 2 4921 8864 Fax: +61 2 4921 6980
Email: martin.johnson@newcastle.edu.au

Complaints about this research: This project has been approved by the University's Human Research Ethics Committee, Approval No. H-2012-0245. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au

Appendix L: Study 2 Information Statement – General Public Online Version

FACULTY OF SCIENCE AND INFORMATION TECHNOLOGY

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

INFORMATION STATEMENT – General Public
(version 2 14/08/12)

The Effect of the Media on Health Behaviour

You are invited to participate in the research project identified above. The research is part of Jay Richards PhD (Clinical Psychology). The research is supervised by Rev Dr. Martin Johnson from the School of Psychology, and co-supervised by Dr. Andrew Rutherford from the School of Psychology, Keele University, Staffordshire, UK.

Why is the research being done?
The purpose of the research is to examine the effectiveness of the media in changing health behaviour.

Who can participate in the research?
We are looking for volunteers who are current tobacco smokers, aged 18 years or over and who are able to communicate at a conversational level in English.

What will you be asked to do?
This study is comprised of a number of questionnaires which can be completed on the internet via an online version. If you agree to participate you will be asked to complete questionnaires at three time points. The questionnaires will ask you about some of your current health behaviours and how vulnerable you may or may not feel about illness. The context for most of the questions will be around the negative health consequences associated with tobacco smoking.

In Part 1 of the study you will be asked to complete a series of questionnaires, that will ask questions about you, your health behaviours and examine your knowledge about the negative consequences associated with tobacco smoking together with your understanding of risk. On completion of these questionnaires you will be again invited to indicate your willingness to participate in Part 2 of the research. You are under no obligation to continue your participation.

Part 2 of the study must be completed one week following completion of Part 1. In Part 2 you will be asked to read a body of text and view images relating to the negative health consequences of tobacco smoking. After reading the text you will be asked to complete a number of short questionnaires regarding your attitudes and beliefs around your smoking behaviour. On completion of these questionnaires you will be again invited to indicate your willingness to participate in Part 3 of the research. You are under no obligation to continue your participation.

One month following your participation in Part 2 of the study you will be invited to participate in Part 3. Part 3 questionnaires will examine you current attitudes and behaviour in relation to tobacco smoking.

How much time will it take?
Part 1 should take a maximum of fifty minutes to complete. Part 2 should take a maximum of eighty minutes to complete. Part 3 should take a maximum of fifty minutes to complete.

What are the risks and benefits of participating?
Although we cannot promise any personal benefit from your participation, participants in similar research have reported benefits from thinking about the health implications of tobacco smoking. By participating in this research you will be entered into a draw to win an IPod Touch. If you complete Part 1 of the study you will receive one entry into the draw to win, if you complete Part 2 you will be receive a further two entries to win (three in total), and if you complete Part 3 you will receive a further two entries to win (five in total). In order for us to contact you in the event that you win this draw you will need to provide the researchers with a valid email address.

Although there are no known risks to participating in this type of research, participants can potentially find some questionnaires regarding health distressing. Some participants may also find the information and images contained in Part 2 of the research distressing as they may raise issues about their own health status. If you are concerned about any of the health issues raised in this study, please contact your local GP. If you feel distressed at any time during the study please remember that you are able to withdraw at any time; also you can contact Lifeline on 131114 for additional support.

How will your privacy be protected?
Any information collected by the researchers will be stored securely at the University of Newcastle in a locked cupboard and /or on a password protected computer only accessible to the researchers. You will be assigned a unique code, only you and the researcher will have access to this code and it will only be used to help us to identify that Part 1, Part 2 and Part 3 questionnaires belong to the same person. Data will be retained for a minimum of 5 years following submission of Jay Richards' PhD thesis, at the University of Newcastle.

How will the information collected be used?
The data collected will be presented at academic conferences and be used as part of papers published in scientific journals, but your anonymity will be preserved at all times and only aggregated data will be reported. The data will also contribute to the PhD student's theses. You will have the option of leaving your email address with the researcher if you would like to be provided with a brief overview of the results of the study once it is complete.

How to participate in the study?
This study is comprised of a number of questionnaires which you will be asked to complete at three time points. If you choose to participate in the study the questionnaires and instructions are available from http://psych.newcastle.edu.au/smoking/. Here you will find full instructions on how to consent and participate in the research. If there is anything you do not understand, or you have questions, please feel free to contact the researchers for clarification.

In Part 1 of the study you will be asked to complete a series of questionnaires, that will ask questions about you, your health behaviour and examine your knowledge about the negative consequences associated with tobacco smoking together with your understanding of risk. At the end of Part 1 of the study you will be invited to indicate your willingness to continue your participation. If you indicate that you would like to continue your participation you will be given a unique code that you should save in a safe place for future reference. This code will be used to identify you should you choose to complete Parts 2 and 3 of the study.

Part 2 of the study must be completed one week following completion of Part 1. We will send you an email reminder when it is time to complete Part 2 with a reminder of the URL where you will find the questionnaires and full instructions.

One month following your participation in Part 2 of the study you will be again invited to participate in Part 3 by email. This email will direct you to where you can find the Part 3 questionnaires. Again full instructions will be available at the study URL.

What choice do you have?
Participation in this research is voluntary. Only those people who give their informed consent will be included in the project. If you do decide to participate, you may withdraw from the project at any time without giving a reason or incurring penalty and have the option of withdrawing any data, which may identify you.

Thank you for considering participating in this study. If you are interested in participating or would like further information please contact Jay Richards at Jay.Richards@newcastle.edu.au or phone Jay Richards on 49 215 910.

Rev. Dr Martin P. Johnson
BSc (Hons) MSc PGC(H)E PhD MAPS CPsychol AFBPsS
Registered Psychologist PSY0001388031
Senior Lecturer

Dr Andrew Rutherford
Senior Lecturer

Jay Richards
PhD Student

Jodie Poole
Research Assistant

Phone: +61 2 4921 8864 Fax: +61 2 4921 6980
Email: martin.johnson@newcastle.edu.au

Complaints about this research: This project has been approved by the University's Human Research Ethics Committee, Approval No. H-2012-0245. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au

Appendix M: Study 2 Information Statement – General Public Paper Version

FACULTY OF SCIENCE AND INFORMATION TECHNOLOGY

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

INFORMATION STATEMENT – General Public (Paper)

(version 2: 29/01/13)

The Effect of the Media on Health Behaviour

You are invited to participate in the research project identified above. The research is part of Jay Richards PhD (Clinical Psychology). The research is supervised by Rev Dr. Martin Johnson from the School of Psychology, and co-supervised by Dr. Andrew Rutherford from the School of Psychology, Keele University, Staffordshire, UK.

Why is the research being done?
The purpose of the research is to examine the effectiveness of the media in changing health behaviour.

Who can participate in the research?
We are looking for volunteers who are current tobacco smokers, aged 18 years or over and who are able to communicate at a conversational level in English.

What will you be asked to do?
This study is comprised of a number of questionnaires which may be completed via mail or online. In this package you will find an Information Statement, Consent Form, Part 1 booklet and a self-addressed envelope. To participate, please complete the consent form and booklet and return these using the self-addressed envelope provided. If you have received this package in error or no longer wish to participate then please dispose of this package responsibly in a recycling bin. Though this package has been sent to you via mail, if you would prefer to participate online full instructions are available at http://psych.newcastle.edu.au/smoking/.

If you agree to participate you will be asked to complete questionnaires at three time points. The questionnaires will ask you about some of your current health behaviours and how vulnerable you may or may not feel about illness. The context for most of the questions will be around the negative health consequences associated with tobacco smoking.

In Part 1 of the study you will be asked to complete a series of questionnaires, that will ask questions about you, your health behaviour and examine your knowledge about the negative consequences associated with tobacco smoking together with your understanding of risk. At the end of Part 1 of the study, you will be given the option of continuing your participation. You will be invited to indicate your willingness to continue your participation. In order to continue your participation you will need to provide your mailing address on the consent form provided in this pack and mail the consent form and the Part 1 booklet to the researchers using the self-addressed envelope provided.

Part 2 of the study must be completed one week following completion of Part 1. If you have indicated you would like to continue your participation a package will be sent to your mailing address containing the Part 2 booklet and a self-addressed envelope. To participate please complete the Part 2 booklet and return it to the researchers using the self-addressed envelope provided. If you no longer wish to participate please dispose of the package in a recycle bin.

During Part 2 you will be asked to read a body of text and view images relating to the negative health consequences of smoking. After reading the text you will be asked to complete a number of short questionnaires regarding your attitudes and beliefs around your tobacco smoking. On completion of these questionnaires you will be again invited to indicate your willingness to participate in Part 3 of the research. You are under no obligation to continue your participation.

One month following your participation in Part 2 of the study you will be invited to participate in Part 3. The questionnaires will be mailed to your address and you will be invited to complete these questionnaires and return them to the researchers using the stamped self-addressed envelope provided. Part 3 questionnaire will examine your current attitudes and behaviour in relation to tobacco smoking and health.

How much time will it take?
Part 1 should take a maximum of fifty minutes to complete. Part 2 should take a maximum of eighty minutes to complete. Part 3 should take a maximum of fifty minutes to complete.

What are the risks and benefits of participating?
Although we cannot promise any personal benefit from your participation, participants in similar research have reported benefits from thinking about the health implications of tobacco smoking. By participating in this research you will be entered into a draw to win an IPod Touch. If you complete Part 1 of the study you will receive one entry into the draw to win, if you complete Part 2 you will be receive a further two entries to win (three in total), and if you complete Part 3 you will receive a further two entries to win (five in total). In order for us to contact you in the event that you win this draw you will need to provide the researchers with a valid mailing/email address.

Although there are no known risks to participating in this type of research, participants can potentially find some questionnaires regarding health distressing. Some participants may also find the information and images contained in Part 2 of the research distressing as they may raise issues about their own health status. If you are concerned about any of the health issues raised in this study, please contact your local GP. If you feel distressed at any time during the study please remember that you are able to withdraw at any time; also you can contact Lifeline on 131114 for additional support.

How will your privacy be protected?
Any information collected by the researchers will be stored securely at the University of Newcastle in a locked cupboard and /or on a password protected computer only accessible to the researchers. You will be assigned a unique code, only you and the researcher will have access to this code and it will only be used to help us to identify that Part 1, Part 2 and Part 3 questionnaires belong to the same person, this information will also be used to ascertain how many chances you have to win the iPod Touch; your unique ID will also appear on the consent form so that we can address Parts 2 and 3 of the research to you should you choose to participate in these section of the research. However, your consent form and response booklet will always be stored separately to preserve your anonymity. Data will be retained for a minimum of 5 years following submission of Jay Richards' PhD thesis, at the University of Newcastle.

How will the information collected be used?
The data collected will be presented at academic conferences and be used as part of papers published in scientific journals, but your anonymity will be preserved at all times and only aggregated data will be reported. The data will also contribute to the PhD student's theses. You will have the option of leaving your mailing/email address with the researcher if you would like to be provided with a brief overview of the results of the study once it is complete.

How to participate in the study?
To participate in the study please complete the consent form and Part 1 booklet and return these to the researcher using the self-addressed envelope provided. If you are interested in participating in Part 2 or 3 of the study please indicate this on the response booklet using the tick box provided at the completion of the response booklets. If at any point you decide that you do not want to continue your participation please dispose of the booklet responsibly in a recycling bin.

What choice do you have?
Participation in this research is voluntary. Only those people who give their informed consent will be included in the project. If you do decide to participate, you may withdraw from the project at any time without giving a reason or incurring penalty and have the option of withdrawing any data, which may identify you.

Thank you for considering participating in this study. If you would like further information please contact Jay Richards at Jay.Richards@newcastle.edu.au or phone Jay Richards on 49 215 910.

Rev. Dr Martin P. Johnson
BSc (Hons) MSc PGC(H)E PhD MAPS CPsychol AFBPsS STB, BTh
Registered Clinical and Health Psychologist PSY0001388031
Senior Lecturer
Phone: +61 2 4921 8864 Fax: +61 2 4921 6980
Email: martin.johnson@newcastle.edu.au

Dr Andrew Rutherford
Senior Lecturer

Jay Richards
PhD Student

Jodie Poole
Research Assistant

Complaints about this research: This project has been approved by the University's Human Research Ethics Committee, Approval No. H-2012-0245. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au

Appendix N: Study 2 Consent Form – Paper Version

FACULTY OF SCIENCE AND
INFORMATION TECHNOLOGY

THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

ID _ _ _ _

CONSENT FORM

The Effect of the Media on Health Behaviour
(Version 2 - 29/01/2013)

I give my consent to participate in the above named research project being conducted by Jay Richards under the supervision of Rev Dr. Martin Johnson (School of Psychology). I have read the information sheet for this study and I consent to participate.

By signing this form, I agree that:

1. I am aware that all the information gathered would be used for research purposes only and that my personal information will remain confidential to the researchers.
2. I understand that only the researchers associated with this research will have access to the data collected and the data will be stored in a locked cabinet and/or on a password protected computer for a minimum period of 5 years.
3. I understand that this research is run in three parts
4. I understand that my participation is voluntary and that I am free to withdraw at any time or decline to answer any questions that I choose
5. Questionnaires will be carried out as described in the Participant Information Statement, a copy of which I have retained
6. I understand that if I choose to participate in Part 2 of the study I will be reading information and viewing images related to tobacco smoking and smoking related illnesses
7. I have had all my questions answered to my satisfaction.

Name: ……………………………………………….

Signature: …………………………….. Date: ……/……/20

Enquiries about the study may be directed to Jay Richards, School of Psychology, Faculty of Science and Information Technology, The University of Newcastle, telephone: 49 215 910 or email Jay.Richards@newcastle.edu.au.

In order for us to organise your participation in Parts 2 and 3 of the research and/or contact you in the event that you win the draw for the iPod Touch please supply your name and address below, please tick the box to indicate your preferred mode of communication:

Name: ______________________________ Address: __________________________________ ❒

Phone: ______________________________ ❒

Email: ______________________________ ❒

❒ Please ✓ if you wish to receive a summary of the results of this research

Rev. Dr Martin P. Johnson
BSc (Hons) MSc PGC(H)E PhD MAPS CPsychol AFBPsS STB, BTh
Registered Clinical and Health Psychologist PSY0001388031
Senior Lecturer

Dr Andrew Rutherford
Senior Lecturer

Jay Richards
PhD Student

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Research Assistant

Phone: +61 2 4921 8864 Fax: +61 2 4921 6980
Email: martin.johnson@newcastle.edu.au

Complaints about this research: This project has been approved by the University's Human Research Ethics Committee, Approval No. H-2012-0245. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au

Appendix O: Study 2 Debrief Sheet

FACULTY OF SCIENCE AND
INFORMATION TECHNOLOGY

THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

The Effect of the Media on Health Behaviour

(Version 1 - 20/06/2012)

Research Team: Rev. Dr. Martin P. Johnson, Jay Richards, Dr. Andrew Rutherford and Jodie Poole

Thank you for your participation in this project.

The aims of this study were to investigate whether persuasive messages and imagery can be used to motivate health behaviour change; and to investigate which factors contribute to an individual's decision to change their health behaviour. We hope that our findings will help us to better understand these effects.

The data gathered during Part 1 of the study will act as a baseline for many of the measures contained in Parts 2 and 3 of the study. The data gathered during Part 1 will be compared to data gathered during Parts 2 and 3 of the study to ascertain whether any change has occurred during the course of the experiment.

During Part 2 of the study you will have been assigned to read one of three threat messages; low, medium or high threat. In the low threat condition participants were exposed to benign imagery/text relating to tobacco smoking and smoking related illness. In the moderate threat condition participants were exposed to mild images/text relating to tobacco smoking and smoking related illness. In the high threat condition participants were exposed to graphic images/text relating to tobacco smoking and smoking related illness. You also will have read one of two efficacy messages. The high efficacy message focused on the effectiveness of quit smoking aids for assisting in quit attempts and offered suggestions on how to make an effective quit attempt. The low efficacy message focused on the difficulties many people have with quitting smoking. All information contained in these messages was factual, but differed in which aspects of the message were emphasised. These messages were designed to manipulate your feelings of threat concerning smoking related health problems and your perceptions of the effectiveness that quitting tobacco smoking will have on your health.

Measures contained in Parts 1, 2 and 3 of the study were designed to measure several factors believed to predict behaviour change following the presentation of a persuasive message. We asked for this information so we can investigate whether some/all of these factors contribute to a person's desire to make positive health changes and to investigate whether the presentation of graphic images/text has any effect on these factors. The health knowledge questionnaire assessed your retention of the information presented to you in the threat and efficacy messages. The non-disclosure of our aims was necessary to ensure the validity of our study.

During Part 3 of the study you will have completed a modified demographics questionnaire and identical versions of some of the measures contained in Parts 2 and 3 of the study. This was to ascertain whether any changes had been made in the month following your participation in Part 2 of the study, and especially to investigate whether the threat and efficacy messages presented in Part 2 of the study prompted any behavioural change.

This experiment was designed to minimise the potential for any harm to your person. However, if you feel that this study has adversely affected you in any way please feel free to speak to the researchers at the completion of the study, contact us on the email address below or contact the Lifeline on 131114

University Counselling Service on 49215801 (this service is only available to University of Newcastle students). If you are concerned about any health issues raised in this study we strongly urge you to contact your GP.

Thank you again for your time.

Kind regards

Martin Johnson (Martin.Johnson@newcastle.edu.au), Jay Richards (Jay.Richards@newcastle.edu.au) and Jodie Poole (Jodie.poole@uon.edu.au), Andrew Rutherford (a.rutherford@keele.ac.uk)

Complaints about this research This project has been approved by the University's Human Research Ethics Committee, Approval No. H-2012-0245 Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au

Appendix P: Study 2 Recruitment Poster

FACULTY OF SCIENCE AND INFORMATION TECHNOLOGY

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

ARE YOU A TOBACCO SMOKER?
ARE YOU INTERESTED IN WINNING A FREE IPOD TOUCH?
IF SO THIS MAY BE THE STUDY FOR YOU!

Why is the research being done?
The purpose of the research is to examine the effectiveness of the media in changing health behaviour.
Who can participate in the research?
We are looking for volunteers who are tobacco smokers and aged over 18 years of age (or who are enrolled in a University of Newcastle program).
What will you be asked to do?
This study has three parts which can be run either online or via mail:

During Part 1 of the study you will be asked to answer some questions about your health and health behaviours. This will be followed by a series of questionnaires. During Part 2 you will be asked to view a body of text and images related to smoking and will then be asked to complete a series of questionnaires. During Part 3 you will be asked to complete another series of questionnaires.
How much time will it take?
Part 1 of the research will take a maximum of fifty minutes to complete.
Part 2 will take a maximum of eighty minutes.
Part 3 will take a maximum of fifty minutes to complete.
How do I participate?
The study is available online at http://psych.newcastle.edu.au/smoking/. Further information and full instructions on how to participate are available at the website.
What do I get for participating?
Every participant in this research will be placed in a draw to win a **FREE IPOD TOUCH**. You can increase your chances of winning by completing Parts 2 and 3.

If you are interested in participating or would like more information regarding this project please email Jay Richards at Jay.Richards@newcastle.edu.au or the project supervisor Rev. Dr Martin Johnson at martin.johnson@newcastle.edu.au.

Thank you for considering this invitation to participate in this study.

Rev. Dr Martin P. Johnson
BSc (Hons) MSc PGC(H)E PhD MAPS CPsychol AFBPsS STB, BTh
Registered Clinical and Health Psychologist PSY0001388031
Senior Lecturer
Phone: +61 2 4921 8864 Fax: +61 2 4921 6980
Email: martin.johnson@newcastle.edu.au

Dr Andrew Rutherford
Senior Lecturer

Jay Richards
PhD Student

Complaints about this research: This project has been approved by the University's Human Research Ethics Committee, Approval No. H-2012-0245. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au

Appendix Q: Study 2 Measures

Throughout the Study 2 measures * = item is reversed scored. Each of the items used the following scale unless otherwise indicated.

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

Demographics Questionnaire

Please read each question and indicate your response by ticking the corresponding box or providing a written answer in the space provided.

1. Sex ❒ Female ❒ Male (please ✓)

2. How old were you on your last birthday _ _ (please specify)

3. During the last month how many/much …
   Cigarettes did you smoke per day? ___________

4. At what age did you start smoking? ___________

5. Have you ever attempted to quit smoking?
   ❒ Yes ❒ No

6. What is the longest time you have ever quit for? _ _ _ Days/weeks/months/years (**please specify and select the correct time period**)

7. Did you use nicotine replacement patches to reduce nicotine cravings?
   ❒ Yes ❒ No

8. Did you use other nicotine replacement products (e.g., gum/lozenges) to reduce nicotine cravings?
   ❒ Yes ❒ No

Susceptibility

I am at risk for smoking related illnesses.

It is likely that I will develop smoking related illnesses.

It is possible that I will develop smoking related illnesses.

Severity

I believe that smoking related illnesses are a severe health problem.

I believe that smoking related illnesses are a serious threat to health.

I believe smoking related illnesses are a significant threat to health.

Self-Efficacy – Quit Attempt

I am able to quit smoking during the next month.

Quitting smoking during the next month will be easy for me.

Quitting smoking during the next month will be difficult for me. *

If I wanted to I could easily quit smoking during the next month.

I am certain that I could quit smoking during the next month.

Self-Efficacy – Use Nicotine Replacement Therapy

I am able to use nicotine replacement therapy products (e.g., patches/lozenges/chewing gum) during the next month.

Using nicotine patches/lozenges/chewing gum during the next month will be easy for me.

Using nicotine patches/lozenges/chewing gum during the next month will be difficult for me.*

If I wanted to I could easily use nicotine patches/lozenges/chewing gum during the next month.

I am certain that I could use nicotine patches/lozenges/chewing gum during the next month.

Self-Efficacy – Avoid Situations Where I Often Feel the Urge to Smoke

I am able to use avoid situations where I often feel the urge to smoke during the next month.

Avoiding situations where I often feel the urge to smoke during the next month will be easy for me.

Avoiding situations where I often feel the urge to smoke during the next month will be difficult for me.*

If I wanted to I could easily avoid situations where I often feel the urge to smoke during the next month.

I am certain that I could avoid situations where I often feel the urge to smoke during the next month.

Response-Efficacy – Quit Attempt

Quitting smoking is effective in preventing smoking related illnesses.

If I quit smoking I am less likely to get smoking related illnesses.

Quitting smoking works in preventing smoking related illnesses

Response-Efficacy – Use Nicotine Replacement Therapy

Using nicotine patches/lozenges/chewing gum is effective in assisting quit attempts.

If I use nicotine patches/lozenges/chewing gum I am more likely to successfully quit smoking.

Using nicotine patches/lozenges/chewing gum works in assisting quit attempts

Response-Efficacy – Avoid Situations Where I Often Feel the Urge to Smoke

Avoiding situations where I often feel the urge to smoke is effective in assisting quit attempts.

If I avoid situations where I often feel the urge to smoke I am more likely to successfully quit smoking.

Avoiding situations where I often feel the urge to smoke works in assisting quit attempts

Attitudes – Quit Attempt

Quitting smoking during the next month would be:

Good 1 2 3 4 5 6 7 Bad *

Unwise 1 2 3 4 5 6 7 Wise

Beneficial 1 2 3 4 5 6 7 Not Beneficial *

Attitudes – Use Nicotine Replacement Therapy

Using nicotine patches/lozenges/chewing gum during the next month would be:

Good 1 2 3 4 5 6 7 Bad *

Pleasant 1 2 3 4 5 6 7 Unpleasant

Unwise 1 2 3 4 5 6 7 Wise

Beneficial 1 2 3 4 5 6 7 Not Beneficial*

Attitudes – Avoid Situations Where I Often Feel the Urge to Smoke

Avoiding situations where I often feel the urge to smoke during the next month would be:

Good 1 2 3 4 5 6 7 Bad *

Pleasant 1 2 3 4 5 6 7 Unpleasant

Unwise 1 2 3 4 5 6 7 Wise

Beneficial 1 2 3 4 5 6 7 Not Beneficial *

Injunctive Norms – Quit Attempt

Most people who are important to me would recommend that I quit smoking during the next month

Most people who are important to me would approve if I quit smoking during the next month

Injunctive Norms – Use Nicotine Replacement Therapy

Most people who are important to me would recommend that I use nicotine patches/lozenges/chewing gum during the next month.

Most people who are important to me would approve if I use nicotine patches/lozenges/chewing gum during the next month.

Injunctive Norms – Avoid Situations Where I Often Feel the Urge to Smoke

Most people who are important to me would recommend that I avoid situations where I often feel the urge to smoke during the next month.

Most people who are important to me would approve if I avoid situations where I often feel the urge to smoke during the next month.

Descriptive Norms – Quit Attempt

Most people who are important to me do not smoke.

Descriptive Norms – Use Nicotine Replacement Therapy

Most smokers who are important to me use nicotine patches/lozenges/chewing gum.

Descriptive Norms – Avoid Situations Where I Often Feel the Urge to Smoke

Most smokers who are important to me avoid situations where they often feel the urge to smoke.

Perceived Controlability – Quit Attempt

It is mostly up to me whether or not if I quit smoking during the next month.

I have control over whether I quit smoking during the next month.

Perceived Controlability – Use Nicotine Replacement Therapy

It is mostly up to me whether or not if I use nicotine lozenges/chewing gum during the next month.

I have control over whether I use nicotine lozenges/chewing gum during the next month.

Perceived Controlability – Avoid Situations Where I Often Feel the Urge to Smoke

It is mostly up to me whether or not I avoid situations where I often feel the urge to smoke during the next month.

I have control over whether I avoid situations where I often feel the urge to smoke during the next month.

Intentions – Quit Attempt

I intend to make an attempt at quitting smoking during the next month.

I will make an attempt at quitting smoking during the next month.

Intentions – Use Nicotine Replacement Therapy

I intend to use nicotine lozenges/chewing gum.

I will use nicotine lozenges/chewing gum

Intentions – Avoid Situations Where I Often Feel the Urge to Smoke

I intend to avoid situations where I often feel the urge to smoke:

I will avoid situations where I often feel the urge to smoke

Knowledge Questionnaire

Threat

Smoking can cause ______________ complications in women.

What are the other health effects of smoking (please list 5):

____

____

____

____

____

Tobacco smoke from ‘light’, ‘mild’ and ‘regular’ cigarettes all contain _____________ amounts of dangerous chemicals.

Smoking is ____________ in a short time it can become very _____________ to stop smoking.

Efficacy

What are some health benefits of quitting smoking (please list 3)
____
____
____

Nicotine replacement therapy _______________ cravings and ________________ symptoms.

In addition to nicotine replacement therapy, ___________________ medications may also assist in making a quit attempt. However, to access these medications you need a _______________ from your ____________.

What are some difficulties that a smoker may have to overcome when making a quit attempt? (Please list 3)
____
____
____

Appendix R: Ethics Approval for Studies 3 and 4

HUMAN RESEARCH ETHICS COMMITTEE

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

Notification of Expedited Approval

To Chief Investigator or Project Supervisor:	**Doctor Martin Johnson**
Cc Co-investigators / Research Students:	**Mr Jay Richards** **Dr Andrew Rutherford** **Ms Ursula Wright**
Re Protocol:	**Improving the Predictive and Explanatory Power of Fear Appeal Theory: The Case for Theoretical Integration**
Date:	**15-Jul-2011**
Reference No:	**H-2011-0181**
Date of Initial Approval:	**15-Jul-2011**

Thank you for your **Response to Conditional Approval (minor amendments)** submission to the Human Research Ethics Committee (HREC) seeking approval in relation to the above protocol.

Your submission was considered under **Expedited** review by the Chair/Deputy Chair.

I am pleased to advise that the decision on your submission is **Approved** effective **15-Jul-2011**.

For noting: Thank you for adding the requested warning to the front of the participant booklets. Please extend this to state explicitly that the booklet contains graphic images which some people may find upsetting.

In approving this protocol, the Human Research Ethics Committee (HREC) is of the opinion that the project complies with the provisions contained in the National Statement on Ethical Conduct in Human Research, 2007, and the requirements within this University relating to human research.

Approval will remain valid subject to the submission, and satisfactory assessment, of annual progress reports. *If the approval of an External HREC has been "noted" the approval period is as determined by that HREC.*

The full Committee will be asked to ratify this decision at its next scheduled meeting. A formal *Certificate of Approval* will be available upon request. Your approval number is **H-2011-0181**.
If the research requires the use of an Information Statement, ensure this

number is inserted at the relevant point in the Complaints paragraph prior to distribution to potential participants You may then proceed with the research.

Conditions of Approval

This approval has been granted subject to you complying with the requirements for *Monitoring of Progress*, *Reporting of Adverse Events*, and *Variations to the Approved Protocol* as detailed below.

PLEASE NOTE:
In the case where the HREC has "noted" the approval of an External HREC, progress reports and reports of adverse events are to be submitted to the External HREC only. In the case of Variations to the approved protocol, or a Renewal of approval, you will apply to the External HREC for approval in the first instance and then Register that approval with the University's HREC.

- ***Monitoring of Progress***

Other than above, the University is obliged to monitor the progress of research projects involving human participants to ensure that they are conducted according to the protocol as approved by the HREC. A progress report is required on an annual basis. Continuation of your HREC approval for this project is conditional upon receipt, and satisfactory assessment, of annual progress reports. You will be advised when a report is due.

- ***Reporting of Adverse Events***

1. It is the responsibility of the person **first named on this Approval Advice** to report adverse events.
2. Adverse events, however minor, must be recorded by the investigator as observed by the investigator or as volunteered by a participant in the research. Full details are to be documented, whether or not the investigator, or his/her deputies, consider the event to be related to the research substance or procedure.
3. Serious or unforeseen adverse events that occur during the research or within six (6) months of completion of the research, must be reported by the person first named on the Approval Advice to the (HREC) by way of the Adverse Event Report form within 72 hours of the occurrence of the event or the investigator receiving advice of the event.
4. Serious adverse events are defined as:

o Causing death, life threatening or serious disability.
o Causing or prolonging hospitalisation.
o Overdoses, cancers, congenital abnormalities, tissue damage, whether or not they are judged to be caused by the investigational agent or procedure.
o Causing psycho-social and/or financial harm. This covers everything from perceived invasion of privacy, breach of confidentiality, or the diminution of social reputation, to the creation of psychological fears and trauma.
o Any other event which might affect the continued ethical

acceptability of the project.

5. Reports of adverse events must include:
   - Participant's study identification number;
   - date of birth;
   - date of entry into the study;
   - treatment arm (if applicable);
   - date of event;
   - details of event;
   - the investigator's opinion as to whether the event is related to the research procedures; and
   - action taken in response to the event.
6. Adverse events which do not fall within the definition of serious or unexpected, including those reported from other sites involved in the research, are to be reported in detail at the time of the annual progress report to the HREC.

- ***Variations to approved protocol***

If you wish to change, or deviate from, the approved protocol, you will need to submit an *Application for Variation to Approved Human Research*. Variations may include, but are not limited to, changes or additions to investigators, study design, study population, number of participants, methods of recruitment, or participant information/consent documentation. **Variations must be approved by the (HREC) before they are implemented** except when Registering an approval of a variation from an external HREC which has been designated the lead HREC, in which case you may proceed as soon as you receive an acknowledgement of your Registration.

Linkage of ethics approval to a new Grant

HREC approvals cannot be assigned to a new grant or award (ie those that were not identified on the application for ethics approval) without confirmation of the approval from the Human Research Ethics Officer on behalf of the HREC.

Best wishes for a successful project.

Professor Alison Ferguson
Chair, Human Research Ethics Committee

For communications and enquiries:
Human Research Ethics Administration
Research Services
Research Integrity Unit
HA148, Hunter Building
The University of Newcastle
Callaghan NSW 2308
T +61 2 492 18999 F +61 2 492 17164
Human-Ethics@newcastle.edu.au

Appendix S: Study 3 and 4 Information Statement - Psychology Students

FACULTY OF SCIENCE AND INFORMATION TECHNOLOGY

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

INFORMATION STATEMENT
(version 1)

The Effect of the Media on Health Behaviour

You are invited to participate in the research project identified above. The research is part of Jay Richards PhD (Clinical Psychology) and Ursula Wright's Honours studies in Psychology at the University of Newcastle. The research is supervised by Rev Dr. Martin Johnson from the School of Psychology, and co-supervised by Dr. Andrew Rutherford from the School of Psychology, Keele University, Staffordshire, UK.

Why is the research being done?
The purpose of the research is to examine the effectiveness of the media in changing health behaviour.

Who can participate in the research?
We are looking for volunteers aged over 18 years of age or are enrolled in a University of Newcastle program.

What will you be asked to do?
This study is comprised of a number of questionnaires. If you agree to participate you will be asked to complete questionnaires at three time points. The questionnaires will ask you about some of your current health behaviours and how vulnerable you may or may not feel about illness. The context for most of the questions will be around the negative consequence of obesity and overweight.

In Part 1 of the study you will be asked to complete a series of questionnaires, that will ask questions about you, your health behaviour and examine your knowledge about the negative consequences associated with obesity and overweight together with your understanding of risk. If you choose to participate in this online study the questionnaires and instructions are available if you click the "Start Survey" button below. Here you will find full instructions on how to consent and participate in the research.

Part 2 of the study must be completed one week following completion of Part 1. Part 2 questionnaires are also available at this SONA page and can be accessed by clicking the "Start Survey" button below when you access this study for a second time, again full instructions will be provided on how to complete the questionnaires.

In Part 2 you will be asked to read a body of text and view images relating to the negative health consequences of overweight and obesity. After reading the text you will be asked to complete a number of short questionnaires regarding your attitudes and beliefs around your diet and exercise. On completion of these questionnaires you will be again invited to indicate your willingness to participate in Part 3 of the research. You are under no obligation to continue your participation.

One month following your participation in Part 2 of the study you will be invited to participate in Part 3. You will be invited to complete the Part 3 questionnaire which is also available at this SONA page and can be accessed by clicking the "Start Survey" button below when you access this study for a third time. Again full instructions will be available at this website. The Part 3 questionnaires will examine your current attitudes and behaviour in relation to diet and exercise.

How much time will it take?
Part 1 should take a maximum of fifty minutes to complete.
Part 2 should take a maximum of eighty minutes to complete.
Part 3 should take a maximum of fifty minutes to complete.

What are the risks and benefits of participating?
If you are enrolled in PSYC1010 or PSYC1020 you can attain course credit for your participation in this research. For participation in Part 1 you will receive 2 points (2%) of course credit. If you choose to continue your participation, Part 2 will entitle you to an additional 3 points (3%) of course credit. If you choose to further continue your participation to Part 3 you can receive an additional 2 points (2%) of course credit. You will also gain first hand experience of research approaches and methods used in psychology.

Although there are no known risks in participating in this type of research, participants can potentially find some questionnaires regarding health distressing, as they may raise issues about your own health status. If you are concerned about any of the health issues raised in this study, please contact your local GP. If you feel distressed at any time during the study please remember that you are able to withdraw at any time; also you can contact Lifeline on 131114 or the University Counselling Service on 49215801.

How will your privacy be protected?
Any information collected by the researchers will be stored securely in a locked cupboard and only accessible to the researchers. You will be assigned a unique code, only you and the researcher will have access to this code and it will only be used to help us to identify that Part 1, Part 2 and Part 3 questionnaires belong to the same person. Data will be retained for a minimum of 5 years following submission of Jay Richards' PhD thesis, at the University of Newcastle.

How will the information collected be used?
The data collected will be presented at academic conferences and be used as part of papers published in scientific journals, but your anonymity will be preserved at all times and only aggregated data will be reported. The data will also contribute to the honours student's and the PhD student's theses. You will have the option of leaving your email address with the researcher if you would like to be provided with a brief overview of the results of the study once it is complete.

What choice do you have?
Participation in this research is voluntary. Only those people who give their informed consent will be included in the project. If you do decide to participate, you may withdraw from the project at any time without giving a reason or incurring penalty and have the option of withdrawing any data, which may identify you.

What do you need to do to participate?
For SONA participants please follow the links provided to consent to participate and complete the questionnaires as instructed. For non-SONA participants, if having read this

Information Statement you would like to participate then please go to http://psych.newcastle.edu.au/media/ where you will be provided with full instructions on how to participate.

If there is anything you do not understand, or you have questions, please feel free to contact the researchers for clarification.

Thank you for considering participating in this study. If you would like further information please contact Jay Richards at Jay.Richards@newcastle.edu.au or phone Jay Richards on 49 215 910.

Rev Dr Martin P. Johnson
BSc (Hons) MSc PGC(H)E PhD MAPS CPsychol AFBPsS
Registered Psychologist PSY0001388031
Senior Lecturer
Phone: +61 2 4921 8864 Fax: +61 2 4921 6980
Email: martin.johnson@newcastle.edu.au

Jay Richards
PhD Student

Ursula Wright
Honours Student

Complaints about this research: This project has been approved by the University's Human Research Ethics Committee, Approval No H-2011-0181 Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au

Appendix T: Study 3 and 4 General Information Statement – General Public

FACULTY OF SCIENCE AND INFORMATION TECHNOLOGY

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

INFORMATION STATEMENT
(version 2 14/07/11)

The Effect of the Media on Health Behaviour

You are invited to participate in the research project identified above. The research is part of Jay Richards PhD (Clinical Psychology) and Ursula Wright's Honours studies in Psychology at the University of Newcastle. The research is supervised by Rev Dr. Martin Johnson from the School of Psychology, and co-supervised by Dr. Andrew Rutherford from the School of Psychology, Keele University, Staffordshire, UK.

This information statement should be read in conjunction with either the pink or blue additional information.

Why is the research being done?
The purpose of the research is to examine the effectiveness of the media in changing health behaviour.

Who can participate in the research?
We are looking for volunteers aged over 18 years of age, who are able to communicate at a conversational level in English.

What will you be asked to do?
This study is comprised of a number of questionnaires which can be completed in either a paper version or on the internet via an online version. If you agree to participate you will be asked to complete questionnaires at three time points. The questionnaires will ask you about some of your current health behaviours and how vulnerable you may or may not feel about illness. The context for most of the questions will be around the negative consequence of obesity and overweight.

In Part 1 of the study you will be asked to complete a series of questionnaires, that will ask questions about you, your health behaviour and examine your knowledge about the negative consequences associated with obesity and overweight together with your understanding of risk. On completion of these questionnaires you will be again invited to indicate your willingness to participate in Part 2 of the research. You are under no obligation to continue your participation.

Part 2 of the study must be completed one week following completion of Part 1. In Part 2 you will be asked to read a body of text and view images relating to the negative health consequences of overweight and obesity. After reading the text you will be asked to complete a number of short questionnaires regarding your attitudes and beliefs around your diet and exercise. On completion of these questionnaires you will be again invited to indicate your willingness to participate in Part 3 of the research. You are under no obligation to continue your participation.

One month following your participation in Part 2 of the study you will be invited to participate in Part 3. Part 3 questionnaires will examine you current attitudes and behaviour in relation to diet and exercise.

How much time will it take?
Part 1 should take a maximum of fifty minutes to complete. Part 2 should take a maximum of eighty minutes to complete. Part 3 should take a maximum of fifty minutes to complete.

What are the risks and benefits of participating?
Although we cannot promise any personal benefit from your participation, participants in similar research have reported benefits from thinking about the health implications of obesity and overweight. Although there are no known risks in participating in this type of research, participants can potentially find some questionnaires regarding health distressing, as they may raise issues about your own health status. If you are concerned about any of the health issues raised in this study, please contact your local GP. If you feel distressed at any time during the study please remember that you are able to withdraw at any time; also you can contact Lifeline on 131114 for additional support.

How will your privacy be protected?
Any information collected by the researchers will be stored securely at the University of Newcastle in a locked cupboard and /or on a password protected computer only accessible to the researchers. You will be assigned a unique code, only you and the researcher will have access to this code and it will only be used to help us to identify that Part 1, Part 2 and Part 3 questionnaires belong to the same person. Data will be retained for a minimum of 5 years following submission of Jay Richards' PhD thesis, at the University of Newcastle.

How will the information collected be used?
The data collected will be presented at academic conferences and be used as part of papers published in scientific journals, but your anonymity will be preserved at all times and only aggregated data will be reported. The data will also contribute to the honours student's and the PhD student's theses. You will have the option of leaving your email address with the researcher if you would like to be provided with a brief overview of the results of the study once it is complete.

What choice do you have?
Participation in this research is voluntary. Only those people who give their informed consent will be included in the project. If you do decide to participate, you may withdraw from the project at any time without giving a reason or incurring penalty and have the option of withdrawing any data, which may identify you.

What do you need to do to participate?
If having read this Information Statement you would like to participate then you have a choice of participating either online or having a paper version.

If you choose to participate online more details are available on the BLUE Participant Information Statement

If you choose to participate using the paper format more details are available on the PINK Participant Information Statement.

If you do not choose to participate please dispose of the questionnaires in a recycling bin. If there is anything you do not understand, or you have questions, please feel free to contact the researchers for clarification.

Thank you for considering participating in this study. If you are interested in participating or would like further information please contact Jay Richards at Jay.Richards@newcastle.edu.au or phone Jay Richards on 49 215 910.

Rev Dr Martin P. Johnson
BSc (Hons) MSc PGC(H)E PhD MAPS CPsychol AFBPsS
Registered Psychologist PSY0001388031
Senior Lecturer
Phone: +61 2 4921 8864 Fax: +61 2 4921 6980
Email: martin.johnson@newcastle.edu.au

Jay Richards
PhD Student

Ursula Wright
Honours Student

Complaints about this research: This project has been approved by the University's Human Research Ethics Committee, Approval No. H-2011-0181. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au

NEWCASTLE | CENTRAL COAST | PORT MACQUARIE | SINGAPORE

The University of Newcastle
Callaghan NSW 2308 Australia
enquirycentre@newcastle.edu.au
CRICOS Provider Number: 00109J
T +61 2 4921 5000
www.newcastle.edu.au

Appendix U: Study 3 and 4 Information Statement – General Public Online

FACULTY OF SCIENCE AND INFORMATION TECHNOLOGY

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

INFORMATION STATEMENT ONLINE VERSION

(version 1 14/07/11)

The Effect of the Media on Health Behaviour

How to participate in the online version of the study?
As mentioned this study is comprised of a number of questionnaires which you will be asked to complete at three time points. The questionnaires will ask you about some of your current health behaviours and how vulnerable you may or may not feel about illness. The context for most of the questions will be around the negative consequence of obesity and overweight.

If you choose to participate in the online version of the study the questionnaires and instructions are available from http://psych.newcastle.edu.au/media/. Here you will find full instructions on how to consent and participate in the research.

In Part 1 of the study you will be asked to complete a series of questionnaires, that will ask questions about you, your health behaviour and examine your knowledge about the negative consequences associated with obesity and overweight together with your understanding of risk. At the end of Part 1 of the study you will be invited to indicate your willingness to continue your participation.

Part 2 of the study must be completed one week following completion of Part 1. We will send you an email reminder when it is time to complete Part 2 with a reminder of the URL where you will find the questionnaires and full instructions.

One month following your participation in Part 2 of the study you will be again invited to participate in Part 3 by email. This email will direct you to where you can find the Part 3 questionnaires. Again full instructions will be available at this website.

What do you need to do to participate?
If having read this Information Statement you would like to participate then go to http://psych.newcastle.edu.au/media/ where you will be provided with full instructions on how to participate. If there is anything you do not understand, or you have questions, please feel free to contact the researchers for clarification.

Rev Dr Martin P. Johnson
BSc (Hons) MSc PGC(H)E PhD MAPS CPsychol AFBPsS
Registered Psychologist PSY0001388031
Senior Lecturer
Phone: +61 2 4921 8864 Fax: +61 2 4921 6980
Email: martin.johnson@newcastle.edu.au

Jay Richards
PhD Student

Ursula Wright
Honours Student

Complaints about this research: This project has been approved by the University's Human Research Ethics Committee, Approval No H-201-0181. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au

Appendix V: Study 3 and 4 Information Statement – General Public Paper Version

FACULTY OF SCIENCE AND INFORMATION TECHNOLOGY

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

INFORMATION STATEMENT PAPER VERSION

(version 1 14/07/11)

The Effect of the Media on Health Behaviour

How to participate in the paper version of the study?
As mentioned this study is comprised of a number of questionnaires which you will be asked to complete at three time points. The questionnaires will ask you about some of your current health behaviours and how vulnerable you may or may not feel about illness. The context for most of the questions will be around the negative consequence of obesity and overweight.

If you choose to participate in the paper version of the study Part 1 and Part 3 will be sent to you by post, we will provide you with a stamped addressed envelope for you to return the questionnaires to us. Part 2 of the study will be completed face-to-face with one of the researchers.

In Part 1 of the study, the questionnaires will be posted to you. The questions will ask about you, your health behaviour and examine your knowledge about the negative consequences associated with obesity and overweight together with your understanding of risk. At the end of Part 1 of the study, you will be given the option of continuing your participation. You will be invited to indicate your willingness to continue your participation and provide a preferred means of contact to arrange the completion of Part 2.

Part 2 of the study must be completed one week following completion of Part 1. You will be invited to make arrangements to complete the Part 2 questionnaires face-to-face with the researcher. The time and location can be arranged at your convenience. We will contact you either by phone, email or mail depending on your preferred mode of communication indicated on the consent form. On completion of these questionnaires you will be again invited to indicate your willingness to participate in Part 3 of the research. You are under no obligation to continue your participation.

One month following your participation in Part 2 of the study we will send you the questionnaires for Part 3 via post. You will be invited to complete these within 5 days of receiving them and return them to the researchers in the stamped addressed envelope provided.

What do you need to do to participate?
If having read this Information Statement you would like to participate please complete the Consent Form and enclosed questionnaire and return them to the researchers using the stamped self addressed envelope provided. If you do not choose to participate please

dispose of the questionnaires in a recycling bin. If there is anything you do not understand, or you have questions, please feel free to contact the researchers for clarification.

Rev Dr Martin P. Johnson
BSc (Hons) MSc PGC(H)E PhD MAPS CPsychol AFBPsS
Registered Psychologist PSY0001388031
Senior Lecturer
Phone: +61 2 4921 8864 Fax: +61 2 4921 6980
Email: martin.johnson@newcastle.edu.au

Jay Richards
PhD Student

Ursula Wright
Honours Student

Complaints about this research: This project has been approved by the University's Human Research Ethics Committee, Approval No H-2011-0181. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au

Appendix W: Study 3 and 4 Consent Form – General Public Paper Version

FACULTY OF SCIENCE AND INFORMATION TECHNOLOGY

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

ID _ _ _ _

CONSENT FORM

The Effect of the Media on Health Behaviour
Version 2 - 14/07/2011

I give my consent to participate in the above named research project being conducted by Jay Richards and Ursula Wright under the supervision of Rev Dr. Martin Johnson (School of Psychology). I have read the information sheet for this study and I consent to participate.

By signing this form, I agree that:

8. I am aware that all the information gathered would be used for research purposes only and that my personal information will remain confidential to the researchers.
9. I understand that only the researchers associated with this research will have access to the data collected and the data will be stored in a locked cabinet and/or on a password protected computer for a minimum period of 5 years.
10. I understand that this research is run in three parts
11. I understand that my participation is voluntary and that I am free to withdraw at any time or decline to answer any questions that I choose
12. Questionnaires will be carried out as described in the Participant Information Statement, a copy of which I have retained
13. I understand that if I choose to participate in Part 2 of the study I will be reading information and viewing images related to obesity and weight related illnesses
14. I have had all my questions answered to my satisfaction.

Name: ……………………………………………….

Signature: …………………………….. Date: ……/……/2011

Enquiries about the study may be directed to Jay Richards, School of Psychology, Faculty of Science and Information Technology, The University of Newcastle, telephone: 49 215 910 or email Jay.Richards@newcastle.edu.au.

In order for us to organise your participation in Parts 2 and 3 of the research please supply your name and address below, please tick the box to indicate your preferred mode of communication:

Name: ________________________________ Address: _____________________________________ ❒

Phone: ________________________________ ❒ Email: _______________________________ ❒

❒ Please ✓ and add your email address if you wish to receive a summary of the results of this research

Email: _______________________________________

Appendix X: Study 3 and 4 Debrief Sheet

FACULTY OF SCIENCE AND INFORMATION TECHNOLOGY

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

The Effect of the Media on Health Behaviour

Research Team: Rev. Dr. Martin P. Johnson, Jay Richards and Ursula Wright

Thank you for your participation in this project.

The aims of this study were to investigate whether persuasive messages and imagery can be used to motivate health behaviour change; and to investigate which factors contribute to an individual's decision to change their health behaviour. We hope that our findings will help us to better understand these effects.

The data gathered during Part 1 of the study will act as a baseline for many of the measures contained in Parts 2 and 3 of the study. The data gathered during Part 1 will be compared to data gathered during Parts 2 and 3 of the study to ascertain whether any change has occurred during the course of the experiment.

During Part 2 of the study you will have been assigned to read one of three threat messages; low, medium or high threat. In the low threat condition participants were exposed to benign imagery/text relating to weight and obesity related illnesses. In the moderate threat condition participants were exposed to mild images/text relating to weight and obesity health related illnesses. In the high threat condition participants were exposed to graphic images/text relating to weight and obesity health relates illnesses. These were set in one of two efficacy conditions. The high efficacy message focused on the effectiveness of healthy diet and exercise in reducing weight and preventing weight gain. The low efficacy message focused on the difficulties many people have with adjusting their diet and beginning exercise. All information contained in these messages was factual, but differed in what was emphasised. These messages were designed to manipulate your feelings of threat concerning weight related health problems and your perceptions of the effectiveness of healthy diet and exercise.

Measures contained in Parts 1, 2 and 3 of the study were designed to measure several factors believed to predict behaviour change following the presentation of a persuasive message. We asked for this information so we can investigate whether some/all of these factors contribute to a person's desire to make positive health changes and to investigate whether the presentation of graphic images/text has any effect on these factors. The health knowledge questionnaire assessed your retention of the information presented to you in the threat and efficacy messages. We hypothesise that participants in the persuasive condition will perform more poorly on the final health questionnaire than those in the mild and control conditions. The non-disclosure of our aims was necessary to ensure the validity of our study.

During Part 3 of the study you will have completed a modified demographics questionnaire and identical versions of some of the measures contained in Parts 2 and 3 of the study. This was to ascertain whether any changes had been made in the month following your participation in Part 2 of the study, and especially to investigate whether the threat and efficacy messages presented in Part 2 of the study prompted any behavioural change.

This experiment was designed to minimise the potential for any harm to your person. However, if you feel that this study has adversely affected you in any way please feel free to speak to the researchers at the completion of the study, contact us on the email address below or contact the Lifeline on 131114 University Counselling Service on 49215801 (this service is only available to University of Newcastle students). If you are concerned about any health issues raised in this study we strongly urge you to contact your GP.

Thank you again for your time.

Kind regards

Martin Johnson (Martin.Johnson@newcastle.edu.au), Jay Richards (Jay.Richards@newcastle.edu.au) and Ursula Wright (ursula.wright@uon.edu.au)

Complaints about this research This project has been approved by the University's Human Research Ethics Committee, Approval No. H-2001-0181 Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au

Appendix Y: Study 3 and 4 Recruitment Poster

FACULTY OF SCIENCE AND INFORMATION TECHNOLOGY

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

The Effect of the Media on Health Behaviour.

You are invited to participate in the research project identified above. The research is part of Jay Richards' PhD (Clinical Psychology) and Ursula Wright's Honours studies in Psychology at the University of Newcastle, supervised by Rev Dr. Martin Johnson from the School of Psychology, and co-supervised by Dr. Andrew Rutherford from the School of Psychology, Keele University, Staffordshire, UK.

Why is the research being done?

The purpose of the research is to examine the effectiveness of the media in changing health behaviour.

Who can participate in the research?

We are looking for volunteers aged over 18 years of age or who are enrolled in a University of Newcastle program.

What will you be asked to do?

This study has three parts which can be run either online or via mail:

During Part 1 of the study you will be asked to answer some questions about your health and health behaviours. This will be followed by a series of questionnaires. If you choose to continue your participation you may complete Part 2 of the study one week following the completion of Part 1. During Part 2 you will be asked to view a body of text and images related to obesity and will then be asked to complete a series of questionnaires. If you choose to continue your participation you may complete Part 3 of the study one month following the completion of Part 1. During Part 3 you will be asked to complete another series of questionnaires.

How much time will it take?

Part 1 of the research will take a maximum of fifty minutes to complete.
Part 2 will take a maximum of eighty minutes.
Part 3 will take a maximum of fifty minutes to complete.
Thank you for considering this invitation to participate in this study.

If you are interested in participating or would like more information regarding this project please email Jay Richards at Jay.Richards@newcastle.edu.au or call on 0432 735 841.

Complaints about this research

This project has been approved by the University's Human Research Ethics Committee, Approval No. H-2011-0181 Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred,to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au.

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The University of Newcastle
Callaghan NSW 2308 Australia
enquirycentre@newcastle.edu.au
CRICOS Provider Number: 00109J
T +61 2 4921 5000
www.newcastle.edu.au

Appendix Z: Reminder Emails for Studies 3 and 4

Reminder Email Part 2

Dear Participant,

Thank you for your recent participation in Part 1 of the research project entitled "The effect of the media on health behaviour". At the completion of Part 1 you indicated that you would be willing to continue your participation in the research project by participating in Part 2. If you are still interested in participating in Part 2 of this research you may do so now by accessing the link below:

http://psych.newcastle.edu.au/media/

If you were issued a unique participant code you will need to use this code to access Part 2 of the project. If you accessed this study via SONA the SONA system should automatically direct you to Part 2 of the project.

If you have any queries or concerns about the research please email Jay Richards at Jay.Richards@newcastle.edu.au.

Kind regards

Jay Richards

Complaints about this research: This project has been approved by the University's Human Research Ethics Committee, Approval No. H-2011-0181. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au

Reminder Email Part 3

Dear Participant,

Thank you for your recent participation in Part 2 of the research project entitled "The effect of the media on health behaviour". At the completion of Part 2 you indicated that you would be willing to continue your participation in the research project by participating in Part 3. If you are still interested in participating in Part 3 of this research you may do so now by accessing the link below:

http://psych.newcastle.edu.au/media/

If you were issued a unique participant code you will need to use this code to access Part 3 of the project. If you accessed this study via SONA the SONA system should automatically direct you to Part 3 of the project.

If you have any queries or concerns about the research please email Jay Richards at Jay.Richards@newcastle.edu.au.

Kind regards

Jay Richards

Complaints about this research: This project has been approved by the University's Human Research Ethics Committee, Approval No. H-2011-0181. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au

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The University of Newcastle
Callaghan NSW 2308 Australia
enquirycentre@newcastle.edu.au
CRICOS Provider Number: 00109J
T +61 2 4921 5000
www.newcastle.edu.au

Appendix AA: Study 3 Measures

Throughout the Study 3 measures * = item is reversed scored. All items use the following scale unless otherwise indicated.

	1	2	3	4	5	6	7
Strongly Disagree							Strongly Agree

Demographics/Past Behaviour Questionnaire

Please read each question and indicate your response by ticking the corresponding box or providing a written answer in the space provided.

1. Sex ❒ Female ❒ Male (please ✓)

2. How old were you on your last birthday _ _ (please specify)

The following questions regard diet and exercise

3. Approximately what is your height in centimetres? _________ cm

4. What is your ideal weight? ____________ kg

5. Approximately what is your weight in kilograms? _________ kg

6. Exercise is defined as physical activity that is planned, structured, and repetitive for the purpose of conditioning any part of the body or increasing physical fitness. How many times <u>per week</u> would you usually exercise? _ _

7. On average, how long are your exercise sessions? _ _ _ minutes

8. For the following questions please give a numerical answer in the space provided

On average, how many times <u>per week</u> do you do each of the following?

Eat fast food (e.g., McDonalds, Pizza Hut)	_ _
Eat foods high in sugar (e.g., chocolates, lollies, cakes)	_ _
Eat foods high in fat (e.g., snack foods, ice cream, butter, meat fats)	_ _
Drink soft drink high in sugar (e.g., Coke, Lemonade)	_ _

Attitudes – Exercise 30 Mins

Exercising for at least 30 minutes per day, 5 days per week during the next month would be:

Good 1 2 3 4 5 6 7 Bad *

Unwise 1 2 3 4 5 6 7 Wise

Beneficial 1 2 3 4 5 6 7 Not Beneficial*

Attitudes – Healthy Diet

Adopting a diet which includes an appropriate balance of the 5 major food groups during the next month would be:

Good 1 2 3 4 5 6 7 Bad *

Unwise 1 2 3 4 5 6 7 Wise

Beneficial 1 2 3 4 5 6 7 Not Beneficial *

Attitudes – Avoid Foods High in Fat

Avoiding food with a high fat content during the next month would be:

Good 1 2 3 4 5 6 7 Bad *

Unwise 1 2 3 4 5 6 7 Wise

Beneficial 1 2 3 4 5 6 7 Not Beneficial *

Attitudes – Fast Food

Minimising my consumption of fast food during the next month would be:

Good 1 2 3 4 5 6 7 Bad *

Unwise 1 2 3 4 5 6 7 Wise

Beneficial 1 2 3 4 5 6 7 Not Beneficial *

Attitudes – Soft Drink

Minimising my consumption of soft drink during the next month would be:

Good 1 2 3 4 5 6 7 Bad *

Unwise 1 2 3 4 5 6 7 Wise

Beneficial 1 2 3 4 5 6 7 Not Beneficial *

Attitudes – Avoid Foods High in Sugar

Minimising my consumption of foods high in sugar during the next month would be:

Good 1 2 3 4 5 6 7 Bad *

Unwise 1 2 3 4 5 6 7 Wise

Beneficial 1 2 3 4 5 6 7 Not Beneficial *

Injunctive Norms – Exercise 30 Mins

Most people who are important to me would recommend that I exercise for at least 30 minutes per day, 5 days per week during the next month

Most people who are important to me would approve if I exercised for at least 30 minutes per day, 5 days per week during the next month

Injunctive Norms – Healthy Diet

Most people who are important to me would recommend that I adopt a diet which includes an appropriate balance of the 5 major food groups during the next month

Most people who are important to me would approve if I adopt a diet which includes an appropriate balance of the 5 major food groups during the next month

Injunctive Norms – Avoid Foods High in Fat

Most people who are important to me would recommend that I avoid food with a high fat content during the next month

Most people who are important to me would approve if I avoid food with a high fat content during the next month

Injunctive Norms – Fast Food

Most people who are important to me would recommend that I minimise my consumption of fast food during the next month

Most people who are important to me would approve if I minimise my consumption of fast food during the next month

Injunctive Norms – Soft Drink

Most people who are important to me would recommend that I minimise my consumption of soft drink during the next month

Most people who are important to me would approve if I minimise my consumption of soft drink during the next month

Injunctive Norms – Avoid Foods High in Sugar

Most people who are important to me would recommend that I minimise my consumption of foods high in sugar during the next month

Most people who are important to me would approve if I minimise my consumption of foods high in sugar during the next month

Descriptive Norms – Exercise 30 Mins

Most people who are important to me exercise for at least 30 minutes per day, 5 days per week

Descriptive Norms – Healthy Diet

Most people who are important to me adopt a diet which includes an appropriate balance of the 5 major food groups

Descriptive Norms – Avoid Foods High in Fat

Most people who are important to me avoid food with a high fat content

Descriptive Norms – Fast Food

Most people who are important to me minimise their consumption of fast food

Descriptive Norms – Soft Drink

Most people who are important to me minimise their consumption of soft drink

Descriptive Norms – Avoid Foods High in Sugar

Most people who are important to me minimise their consumption of foods high in sugar

Motivation to Comply

When it comes to matters of my health, I want to do what people who are important to me want me to do

When it comes to my exercise behaviour, I want to do what people who are important to me want me to do

When it comes to matters of my eating habits, I want to do what people who are important to me want me to do

Perceived Controllability – Exercise 30 Mins

It is mostly up to me whether or not I exercise for at least 30 minutes per day, 5 days per week during the next month

I have control over whether I exercise for at least 30 minutes per day, 5 days per week during the next month

Perceived Controllability – Healthy Diet

It is mostly up to me whether or not I adopt a diet which includes an appropriate balance of the 5 major food groups during the next month

I have control over whether I adopt a diet which includes an appropriate balance of the 5 major food groups during the next month

Perceived Controllability – Avoid Foods High in Fat

It is mostly up to me whether or not I avoid food with a high fat content during the next month

I have control over whether I avoid food with a high fat content during the next month

Perceived Controllability – Fast Food

It is mostly up to me whether or not I minimise my consumption of fast food during the next month

I have control over whether I minimise my consumption of fast food during the next month

Perceived Controllability – Soft Drink

It is mostly up to me whether or not I minimise my consumption of soft drink during the next month

I have control over whether I minimise my consumption of soft drink during the next month

Perceived Controllability – Avoid Foods High in Sugar

It is mostly up to me whether or not I minimise my consumption of foods high in sugar during the next month

I have control over whether I minimise my consumption of foods high in sugar during the next month

Susceptibility

I am at risk of adverse health effects because of my weight.

It is likely that I will develop adverse health effects because of my weight.

It is possible that I will develop adverse health effects because of my weight.

Severity

I believe that the health effects of increased weight are severe.

I believe that the health effects of increased weight are a serious threat to my health.

I believe that the health effects of increased weight are significant.

Self-Efficacy – Exercise 30 Mins

I am able to exercise for at least 30 minutes per day, 5 days per week during the next month.

Exercising for at least 30 minutes per day, 5 days per week during the next month will be easy for me.

Exercising for at least 30 minutes per day, 5 days per week during the next month will be inconvenient for me. *
Exercising for at least 30 minutes per day, 5 days per week during the next month will be difficult for me. *

If I wanted to I could easily exercise for at least 30 minutes per day, 5 days per week during the next month

I am certain that I could exercise for at least 30 minutes per day, 5 days per week during the next month

Self-Efficacy – Healthy Diet

I am able to adopt a diet which includes an appropriate balance of the 5 major food groups during the next month.

Adopting a diet which includes an appropriate balance of the 5 major food groups during the next month will be easy for me.

Adopting a diet which includes an appropriate balance of the 5 major food groups during the next month will be inconvenient for me. *

Adopting a diet which includes an appropriate balance of the 5 major food groups during the next month will be difficult for me. *

If I wanted to I could easily adopt a diet which includes an appropriate balance of the 5 major food groups during the next month

I am certain that I could adopt a diet which includes an appropriate balance of the 5 major food groups during the next month

Self-Efficacy – Avoid Foods High in Fat

I am able to avoid eating food with a high fat content during the next month.

Avoiding food with a high fat content during the next month will be easy for me.

Avoiding food with a high fat content during the next month will be inconvenient for me. *

Avoiding food with a high fat content during the next month will be difficult for me. *

If I wanted to I could easily avoid food with a high fat content during the next month

I am certain that I could avoid food with a high fat content during the next month

Self-Efficacy – Fast Food

I am able to minimise my consumption of fast food during the next month.

Minimising my consumption of fast food during the next month will be easy for me.

Minimising my consumption of fast food during the next month will be inconvenient for me. *

Minimising my consumption of fast food during the next month will be difficult for me. *

If I wanted to I could easily minimise my consumption of fast food during the next month

I am certain that I could minimise my consumption of fast food during the next month

Self-Efficacy – Soft Drink

I am able to minimise my consumption of soft drinks during the next month.

Minimising my consumption of fast food during the next month will be easy for me.

Minimising my consumption of soft drinks during the next month will be inconvenient for me. *

Minimising my consumption of soft drinks during the next month will be difficult for me. *

If I wanted to I could easily minimise my consumption of soft drink during the next month

I am certain that I could minimise my consumption of soft drink during the next month

Self-Efficacy – Avoid Foods High in Sugar

I am able to minimise my consumption of foods high in sugar during the next month.

Minimising my consumption of foods high in sugar during the next month will be easy for me.

Minimising my consumption of foods high in sugar during the next month will be inconvenient for me. *

Minimising my consumption of foods high in sugar during the next month will be difficult for me. *

If I wanted to I could easily minimise my consumption of foods high in sugar during the next month

I am certain that I could minimise my consumption of foods high in sugar during the next month

Response-Efficacy – Exercise 30 Mins

Exercising for at least 30 minutes per day, 5 days per week is effective in preventing weight related health problems.

If I exercise for at least 30 minutes per day, 5 days per week I am less likely to get weight related health problems.

Exercising for at least 30 minutes per day, 5 days per week works in preventing weight related health problems

Response-Efficacy – Healthy Diet

Adopting a diet which includes an appropriate balance of the 5 major food groups is effective in preventing weight related health problems.

If I adopt a diet which includes an appropriate balance of the 5 major food groups I am less likely to get weight related health problems.

Adopting a diet which includes an appropriate balance of the 5 major food groups works in preventing weight related health problems

Response-Efficacy – Avoid Foods High in Fat

Avoiding food with a high fat content is effective in preventing weight related health problems.

If I avoid food with a high fat content I am less likely to get weight related health problems.

Avoiding food with a high fat content works in preventing weight related health problems

Response-Efficacy – Fast Food

Minimising my consumption of fast food is effective in preventing weight related health problems.

If I minimise my consumption of fast food I am less likely to get weight related health problems.

Minimising my consumption of fast food works in preventing weight related health problems

Response-Efficacy – Soft Drink

Minimising my consumption of soft drink is effective in preventing weight related health problems.

If I minimise my consumption of soft drink I am less likely to get weight related health problems.

Minimising my consumption of soft drink works in preventing weight related health problems

Response-Efficacy – Avoid Foods High in Sugar

Minimising my consumption of foods high in sugar is effective in preventing weight related health problems.

If I minimise my consumption of foods high in sugar I am less likely to get weight related health problems.

Minimising my consumption of foods high in sugar works in preventing weight related health problems

Intentions – Exercise 30 Mins

I intend to exercise for at least 30 minutes per day, 5 days per week during the next month.

I will exercise for at least 30 minutes per day, 5 days per week during the next month

Intentions – Healthy Diet

I intend to adopt a diet which includes an appropriate balance of the 5 major food groups during the next month.

I will adopt a diet which includes an appropriate balance of the 5 major food groups during the next month

Intentions – Avoid Foods High in Fat

I intend to avoid food with a high fat content during the next month.

I will avoid food with a high fat content during the next month

Intentions – Fast Food

I intend to minimise my consumption of fast food during the next month.

I will minimise my consumption of fast food during the next month

Intentions – Soft Drink

I intend to minimise my consumption of soft drink during the next month.

I will minimise my consumption of soft drink during the next month

Intentions – Avoid Foods High in the Sugar

I intend to minimise my consumption of foods high in sugar during the next month.

I will minimise my consumption of foods high in sugar during the next month

Threat Health Knowledge

Please list the adverse health effects associated with obesity:

____
____
____
____
____

Efficacy Health Knowledge

To lose weight you must consume fewer _____________ than your body _____________ each day.

Please list the National Health and Medical Research Council eating recommendations to maintain healthy weight and good health:

____
____
____
____
____

To achieve weight loss and individual should reduce _____________ intake, improve _____________ and increase _______________.

Exercise increases the number of ___________ the body uses, burns ____________ and builds ____________.

It is recommended that you engage in at least ___________ minutes of moderate exercise _____________ days per week to achieve weight loss and maintain good health.

If you have not exercised or have not exercised in a long time before it is recommended that you ____________ ____________ ______________ before increasing your physical activity.

Appendix AB: Study 4 Threat Messages

Low Threat

Weight and Health

Overweight and obesity are labels for weight ranges that are greater than what is generally considered healthy for a given height. The terms also identify ranges of weight that have been shown to increase the likelihood of certain diseases and other health problems. These health problems can be prevented by maintaining healthy weight. There are several simple guides for assessing the amount and distribution of body fat. These include:

- Body Mass Index (BMI): the ratio of weight to height squared (kg/m^2). See table 1 for the BMI values which correspond to normal weight, overweight and obesity.
- Waist Circumference: Measurement around the waist.
- Waist to Hip Ratio: the ratio of waist circumference to hip circumference. Too much weight around the waist (apple shaped) is more of a health risk than too much weight around the hips (pear shaped).
- Body composition: the percentage of body weight which is fat.

Label	**BMI**
Underweight	<18.5
Normal Weight	18.5 – 24.9
Overweight	25.0 – 29.9
Obese Class I	30.0 – 34.9
Obese Class II	35.0 – 39.9
Obese Class III	≥40

Table 1: BMI values which correspond to weight labels.

Overweight and obesity can have several adverse health effects including:

Constipation	High cholesterol
Tiredness	Difficulty breathing
Lower back pain	Problems with sleeping
Increased sweating	Fatigue
Sore joints	Infertility
Stroke	Impotence
Hypertension (high blood pressure)	

Overweight and obesity also increases the risk of several diseases including:

Heart disease	Sleep Apnoea
Type II diabetes	Some cancers
Osteoarthritis	Stroke
Gout	Asthma

Excess weight is also associated with depression and low self esteem. Further, excess weight may limit job prospects and make many everyday activities more difficult.

Weight gain occurs when energy (food) intake exceeds the amount of energy used during daily tasks. This excess energy is stored as fat. The amount of energy needed varies from person to person depending on their age, sex, level of physical activity and metabolic rate (rate at which the body burns energy). Most cases of obesity are primarily determined by health behaviours including:

- Physical Inactivity: Metabolic rate decreases progressively with age. Physical inactivity accelerates this decline in the metabolic rate. This means engaging in less physical activity will result in faster weight gain, even if energy (food) intake remains constant.
- Overeating: Increases in energy (food) intake will lead to greater weight gain (unless this is offset by increased physical activity; see figure 1).
- Poor diet: Diets high in saturated fat and sugar are high in energy and will generally lead to weight gain. Pizza, pies, hamburgers, chips, butter, cakes, soft drinks and alcohol all promote weight gain (see figure 2).

Figure 1: Physical Inactivity and overeating are both major causes of obesity.

Figure 2: Examples of a New York City public service campaign highlighting the calorie counts of unhealthy foods.

Moderate Threat

Weight and Health

Overweight and obesity are labels for weight ranges that are generally considered unhealthy for a given height. Obesity has been shown to increase the likelihood of several serious medical conditions. For example, obesity increases the risk of stroke which causes over 11,000 deaths in Australia per year. There are several simple guides for assessing the amount and distribution of body fat. These include:

- Body Mass Index (BMI): the ratio of weight to height squared (kg/m^2). A male of average height (1.75 metres, 5ft, 9in) who weighs 77kg or heavier is considered overweight, and is at increased risk of weight related illnesses. A female of average height (1.65 metres, 5ft, 6in) who is 68kg or heavier is considered overweight, and is at increased risk of weight related illnesses. See table 1 for the BMI values which correspond to normal weight, overweight and obesity.
- Waist Circumference: Measurement around the waist.
- Waist to Hip Ratio: the ratio of waist circumference to hip circumference. Too much weight around the waist (apple shaped) is more of a health risk than too much weight around the hips (pear shaped).
- Body composition: the percentage of body weight which is fat.

If a person’s BMI is 25.0 or above their risk of serious health consequences increases.

Label	BMI	Risk of ill health
Underweight	<18.5	
Normal range	18.5 – 24.9	Average
Overweight	25.0 – 29.9	Increased
Obese class I	30.0 – 34.9	Moderate
Obese class II	35.0 – 39.9	Severe
Obese class III	≥40.0	Very severe

Table 1: BMI values which correspond to weight labels and corresponding risk of ill health.

Overweight and obese individuals are at greater risk for several adverse health effects including:

Constipation	High cholesterol
Tiredness	Difficulty breathing
Lower back pain	Problems with sleeping
Increased sweating	Fatigue
Sore joints	Infertility
Stroke	Impotence
Hypertension (high blood pressure)	

As people gain excess body fat their physical appearance will change. Many areas of the body will become visibly larger and poorly defined. The obese may walk with a widened stance to better support their increased body weight, placing stress on their joints. As a result, they may develop osteoarthritis, especially in the knees, hips and ankles and your feet and ankles may become sore and swollen. They may also experience lower back pain. They may be less able to engage in physical and social activities due to lack of mobility and increased fatigue. They may sweat more which can lead to skin disorders as moisture gets caught between skin folds. Their lungs may become compressed by excess fat causing shortness of breath even with minimal exertion. They may also experience disturbed sleep causing increased daytime tiredness. In addition to these symptoms, obesity increases the risk of several diseases including:

- Coronary Heart Disease: Coronary heart disease is caused by a build up of fatty material, calcium and scar tissue which block the flow of blood through the arteries which supply blood to the heart. Partial blocking of arteries can cause chest pain and arm pain (usually on the left side). If blood flow stops completely a heart attack may ensue (see figure 1), which can cause heart damage or death. In 2007, coronary heart disease was the most common cause of death in Australia, responsible for over 12,000 male deaths (approx. 17% of all male deaths) and over 10,500 female deaths (approx 15% of all female deaths).

Figure 1: Obesity increases the risk of heart attack.

- Type II Diabetes: Type II Diabetes is a condition where the body develops a resistance to the effects of insulin. Insulin helps move glucose from the blood into the cells. 80 to 90% of people who have Type II diabetes are obese. Symptoms of diabetes include frequent urination, increased thirst, increased hunger and fatigue. Long term complications of high blood sugar include urinary tract infections, diarrhoea, gangrene in the extremities (see figure 2) and impotence. In Australia, type II diabetes is responsible for over 1,900 male deaths (approx. 2.7% of all male deaths) and over 1800 female deaths (approx 2.8% of all female deaths) per year.

Individuals who are overweight or obese are also at increased risk of several other serious diseases including:

Heart disease	Sleep Apnoea
Type II diabetes	Some cancers
Osteoarthritis	Stroke
Gout	Asthma

Individuals who are overweight or obese are also at increased risk for depression and low self esteem. Further, overweight or obese individuals may have limited job prospects and have difficulty performing many everyday activities.

Figure 2: Examples of the effect that gangrene can have in the extremities.

Figure 3: Examples of gout affecting the foot and hand.

Although a person's tendency to gain weight is, in part, genetically determined, most cases of obesity are primarily determined by the person's health behaviours including:

- Physical Inactivity: A person's metabolic rate decreases progressively with age. Physical inactivity accelerates this decline in the metabolic rate. This means that people who engage in less physical activity will gain weight faster even if they do not increase their energy (food) intake.
- Overeating: When a person increases their energy (food) intake they will gain weight (unless this is offset by increased physical activity).
- Poor diet: People who have diets high in saturated fat and sugar will generally experience weight gain. High fat foods, processed foods, fast food, soft drinks and alcohol all promote weight gain (see figure 4).

The rate of overweight and obesity in Australia continues to increase. Currently 42% of males and 31% of females are overweight. A further 25% of males and 24% of females are obese. This means that normal weight is now the exception, not the norm. Therefore, it is likely that all Australians will be personally affected by weight related illnesses or will know someone who is affected.

Figure 3: Example of a public service campaign titled "Are you Pouring on the Pounds?" highlighting the adverse health effects of drinking soft drinks high in sugar

Below is a case study which illustrates the some of the health effects of overweight and obesity:

Case Study

A 52-year-old woman with obesity and a 2 year history of type 2 diabetes presents with complaints of fatigue, difficulty losing weight, and no motivation. She reports frequent urination and extreme hunger and thirst. On physical exam, her height is measured at 1.71m (5ft 3in) and her weight is 94kg giving her a BMI of 31.46 (Obesity stage I).

Patient notes a marked decrease in her energy level, particularly in the afternoons. She is tearful and states that she was diagnosed with depression four years ago and has been prescribed antidepressants.

She states that she has continued to gain weight since being placed on insulin one year ago. Her weight has continued to increase over the past year, and she is presently at the highest weight she has ever been. She states that every time she tries to cut down on her food consumption she experiences shakiness and extreme hunger. She does not follow any specific diet and has been so fearful of hypoglycaemia (low blood sugar) that she often eats extra snacks.

Her health care practitioners have repeatedly advised weight loss and exercise to improve her health status. However, she complains that pain in her knees and ankles make it difficult to do any exercise. If she is unable to lose weight she is likely to have more serious complications in the future.

High Threat

Weight and Health

Overweight and obesity are labels for weight ranges that are considered unhealthy for a given height. The terms also identify ranges of weight that have been shown to increase the likelihood of several life threatening medical conditions. For example, obesity increases the risk of stroke which kills over 11,000 Australian's every single year. There are several simple guides for assessing the amount and distribution of body fat. These include

- Body Mass Index (BMI): the ratio of weight to height squared (kg/m^2). If you are a male of average height (1.75 metres, 5ft, 9in) who weighs 77kg or over you are considered overweight, and at increased risk of dying from obesity related illnesses. If you are a female of average height (1.65 metres, 5ft, 6in) who weighs 68kg or heavier you are considered overweight, and at increased risk of dying from obesity related illnesses. See table 1 for the BMI values which correspond to normal weight, overweight and obesity.
- Waist Circumference: Measurement around the waist.
- Waist to Hip Ratio: the ratio of waist circumference to hip circumference. Too much weight around the waist (apple shaped) is more of a health risk than too much weight around the hips (pear shaped).
- Body composition: the percentage of body weight which is fat.

If your BMI is between 25.0 and 32.0 your risk of premature death almost doubles. If you are morbidly obese (BMI > 40.0) you are 12 times more likely to die prematurely when compared to individuals of normal weight.

Label	BMI	Risk of ill health
Underweight	<18.5	
Normal range	18.5 - 24.9	Average
Overweight	25.0 - 29.9	Increased
Obese	30.0 - 34.9	Moderate
Severely Obese	35.0 - 39.9	Severe
Morbidly Obese	≥40.0	Extreme

Table 1: BMI values which correspond to weight labels and corresponding risk of ill health or death.

If you are overweight or obese you are at increased risk for several adverse and potentially life threatening health effects including:

Constipation	High cholesterol
Tiredness	Difficulty breathing
Lower back pain	Problems with sleeping
Increased sweating	Fatigue
Sore joints	Infertility
Stroke	Impotence
Hypertension (high blood pressure)	

As you gain excess body fat your physical appearance will change. Many areas of your body will become visibly larger and more ‘flabby’. You may need to walk with a widened stance to better support your increased body weight, placing increased stress on your joints. As a result, you may develop osteoarthritis, especially in the knees, hips and ankles and your feet and ankles may become very sore and swollen. You may also experience severe lower back pain. You will be less able to engage in physical and social activities due to lack of mobility and increased fatigue. You will notice that you start to sweat more which can lead to hideous and painful skin infections as moisture gets caught between your skin folds. Your lungs may become compressed by excess fat causing breathlessness, even with minimal exertion. You may also experience disturbed sleep leading to increased daytime tiredness. In addition to these symptoms, obesity increases the risk of several deadly diseases including:

- **Coronary heart disease**: Coronary heart disease is caused by a build up of fatty material, calcium and scar tissue which block the flow of blood through the arteries which supply blood to the heart. If you have coronary heart disease you may experience severe chest pain and irregular heartbeat. If your blood flow stops completely you may have a heart attack, which can cause heart damage or death. In 2007, coronary heart disease killed more Australians than any other disease. It killed over 12,000 male Australians (approx. 17% of all male deaths) and killed over 10,500 female Australians (approx 15% of all female deaths; see figures 1 and 2).

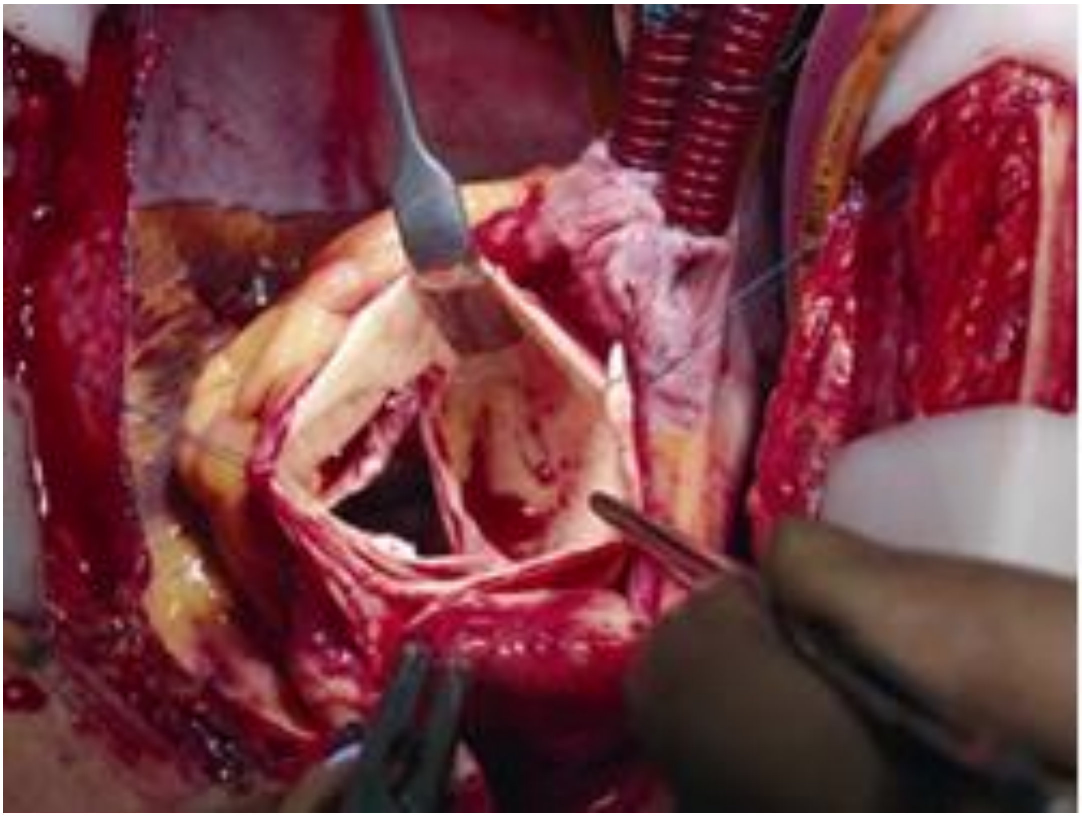

Figure 1: If you have coronary heart disease you may require heart bypass surgery.

- **Type 2 Diabetes**: Type 2 Diabetes is a condition where the body develops a resistance to the effects of insulin. Insulin helps move glucose from the blood into the cells. Approximately 80 to 90% of people who have Type 2 Diabetes are obese. If you have diabetes you may experience frequent urination, increased thirst, increased hunger and fatigue. In the longer term you may experience blindness, heart attack, stroke, gangrene of the feet and hands (requiring amputation; see figure 3), coma and death. In Australia, Type 2 Diabetes kills over 1,900 male Australians (approx. 2.7% of all male deaths) and over 1800 female Australians (approx 2.8% of all female deaths) per year.

If you are overweight or obese you are also at increased risk of several other life threatening diseases including:

Heart disease	Sleep Apnoea
Type II diabetes	Some cancers
Osteoarthritis	Stroke
Gout	Asthma

Figure 2: Images from a public service campaign titled “Obesity is Suicide”.

Figure 3: Examples of gangrene affecting the hands and feet. If you develop diabetes, you may develop gangrene due to poor circulation requiring amputation (far right).

If you are overweight or obese you may be at increased risk for depression and low self esteem. Further, being overweight or obese will limit your job prospects and cause considerable difficulty performing many everyday activities.

Although your tendency to gain weight is, in part, genetically determined, weight gain can occur surprisingly quickly if you engage in unhealthy behaviours including:

- Physical Inactivity: Your metabolic rate decreases progressively with age. Physical inactivity will accelerate this decline in your metabolic rate. This means if you engage in less physical activity you will gain weight faster, even if you do not increase their energy (food) intake.
- Overeating: The more food you eat, the more weight you will gain (unless this is offset by increased physical activity).
- Poor diet: High fat foods, processed foods, fast food, soft drinks and alcohol all promote weight gain. If your diet consists of foods and drinks such as these it is likely that you will experience weight gain and become overweight or obese.

The rates of overweight and obesity in Australia continues to increase. Currently 42% of males and 31% of females are overweight. A further 25% of males and 24% of females are obese and at high risk of deadly consequences. These rates are predicted to increase in the future. This means that normal weight is now the exception not the norm. Therefore, it is very likely that you will be personally affected by weight related illnesses or you will know someone who is affected.

Below is a case study which illustrates the some of the health effects of overweight and obesity:

Case Study:

A 32-year-old morbidly obese woman was found dead by a friend on the floor of her apartment following a massive heart attack. She was known to have a long history of hypertension (high blood pressure) and Type 2 Diabetes. Friends and family report that she was always slightly overweight in her childhood. She lived a sedentary lifestyle, not particularly interested in participating in sports or exercise. During her teenage years and early 20’s she began to put on weight slowly, a kilo here and there, not serious enough to worry about.

At age 24 she developed Type 2 Diabetes and became less able to control her eating. She gained weight very quickly and was soon showing visible signs of obesity. She often complained of sore joints and tiredness and began to find working as a store clerk very difficult. She was fired from her job when she was 27 after showing up late on several occasions. She found it difficult to find another job and suspected that employers were unwilling to employ her because she was ‘too fat’.

By the time she was 30 large doses of insulin were often needed to control her blood glucose levels and she almost overdosed on three separate occasions needing to be rushed to hospital. Her right foot had to be amputated due to gangrene (see figure 3 for reference) and she had become blind, both complications of her diabetes. She was too heavy for crutches and frequently soiled herself as her extreme weight, foot amputation and sore joints made it nearly impossible for her to travel to the bathroom alone. She had a long history of depression which worsened following her foot amputation. The lack of mobility following the amputation was very frustrating for her; she spent most of her days in bed. She became unable to work or attend social events and relied on friends and family to help with chores and help her move about the house.

A physical examination of her body revealed several weeping diabetic ulcers on the arms, bleeding and pus-infested sores all over her body from a long history of poorly healed sores and skin infections. She also had severe yeast infections of the vagina and anus. Her height was measured at 1.76m and her weight was 130kg (BMI = 41, morbidly obese).

Appendix AC – Study 4 Efficacy Messages

Low Efficacy

Achieving weight loss can be a slow and frustrating process. Significant changes often need to be made to diet, and time needs to be found for exercise almost every day. Often a lot of effort is needed to achieve only a small loss of weight.

To lose weight you must consume fewer calories than your body uses each day. There are about 37,000 kilojoules (7700 calories) in every kilogram of fat (or 3,500 per pound). Therefore, if you want to lose 0.5kg of fat (approximately 1.1 pounds) you will need to consume about around 1750 fewer kilojoules (around 420 calories) per day for 10 days. This is equivalent to about 1.5 peanut butter sandwiches.

Many people try and lose weight quickly through crash dieting. Crash dieting refers to adopting a diet which is very low in calories. During crash diets the dieter is essentially starving themselves. Contrary to popular belief crash dieting is neither healthy nor effective for achieving long term weight loss. While crash dieting can lead to some weight loss in the short term there are some important reasons why crash dieting does not work in the long term:

- Crash dieting decreases your metabolism: this means that the body attempts to conserve every calorie, so weight loss becomes more difficult.
- The weight does not stay off: weight loss from crash dieting is only maintained while the diet continues. Once an individual reverts back to their normal diet the weight is regained very quickly.
- Diets cause energy loss: when an individual eats less food their energy levels fall which can cause lethargy and tiredness.
- Crash dieting is hard: low calorie diets leave the dieter feeling extremely hungry. Most people are unable to continue with restrictive diets and give up. When the dieter gives up they can feel helpless, disheartened and depressed. Often when an individual believes that they cannot diet successfully they adopt an unhealthy diet and may end up heavier than they were before the diet.

Furthermore, many diets are unhealthy especially those which seek to restrict a food group (e.g., Atkins). Dieticians suggest that an appropriate balance of carbohydrates, fats and proteins are needed to maintain good health. Diets which restrict any of these may help with weight loss but will also cause deficiencies in the body.

To maintain healthy weight and good health the National Health and Medical Research Council recommends that you:

- Eat mainly grain based and plant based foods (e.g., wholemeal bread, pasta, rice, cereals, fruit and vegetables)
- Eat moderate amounts of lean meat, chicken, fish and eggs (or vegetarian alternatives)
- Replace dairy products with low fat alternatives wherever possible
- Drink plenty of water

Another method of weight loss that people often use is exercise. Exercise increases the number of calories the body uses, burns fat and builds muscle. For example, power-walking burns 21–36 kilojoules (5-9 calories) per minute and jogging burns 56 kilojoules (13 calories) a minute. Therefore, you can burn around 1200-2100 kilojoules (300-540 calories) in an hour by power-walking and around 3350 kilojoules (800 calories) in an hour by jogging. It is recommended that you engage in at least 30 minutes of moderate exercise 5 days per week to achieve weight loss and maintain good health.

Reasons why people do not exercise include

- Don’t have the time
- Boredom: Walking on a treadmill or a walking path can get old fast.
- Soreness: If you have not exercised for a while it is likely that you will be very sore after exercising.
- Can’t afford gym membership
- Tried exercising but did not lose weight: often your body can take time to react to increased exercise. It may be up to 12 weeks before you notice any real change.
- Don’t know how to exercise
- Tiredness/stress

It is important not to over exert yourself during exercise. You should exercise at a level of exertion which is enough to increase your heart and breathing rate, but not so much that you cannot hold a conversation. If you have not exercised or have not exercised in a long time before it is recommended that you contact your physician before increasing your physical activity.

Achieving weight loss is often a slow and frustrating process. Especially given that dieting is not effective in the long term and exercise can be time consuming, boring, and painful, and results are often slow.

High Efficacy

There are a number of simple but effective lifestyle changes you can make to lose weight, and even if you are not overweight or obese adopting these changes will prevent weight gain in the future and help you maintain good health. The main way to lose weight is adjusting diet and regular exercise.

To lose weight you must consume fewer calories than your body uses each day. There are about 37,000 kilojoules (7700 calories) in every kilogram of fat (or 3,500 per pound). Therefore, if you want to lose 0.5kg of fat (approximately 1.1 pounds) you will need to consume about around 1750 fewer kilojoules (around 420 calories) per day for 10 days. This is equivalent to only 2.5 cans of cola per day!

Weight loss can also be achieved by replacing high energy foods with low calorie alternatives. High calorie foods include hamburgers, meat fat, fried food, snack food and soft drink. Low calorie foods include fruit, vegetables, grains, fish and water. Below are a few simple things you can do to achieve weight loss by reducing your calorie intake.

- You can replace sugary soft drinks with sugar free beverages or water
- You can reduce intake of foods high in saturated fat and sugar and replace these with fruit, vegetables, foods high in fibre, and fluids
- Carbohydrates are best for when you need an energy boost. Therefore, you should eat foods high in carbohydrates in the morning or before exercise and avoid foods high in carbohydrates at night
- Throw out all foods in the house which are high in saturated fat or sugar.
- Be an informed consumer: You can read food labels so you are aware of the composition and calorie content of the foods and beverages you are consuming
- There are several books and websites (e.g., www.taste.com.au) which provide low fat but great tasting recipes.

To maintain healthy weight and good health the National Health and Medical Research Council recommends that you:

- Eat mainly grain based and plant based foods (e.g., wholemeal bread, pasta, rice, cereals, fruit and vegetables)
- Eat moderate amounts of lean meat, chicken, fish and eggs (or vegetarian alternatives)
- Replace dairy products with low fat alternatives wherever possible
- Drink plenty of water

To lose weight you should:

- Limit consumption of foods high in saturated fat, and use monounsaturated (canola and olive oils) and polyunsaturated (sunflower and fish oils) alternatives. Fat contains about twice the amount of energy as protein and carbohydrates. Therefore, eating less fat is an important way to reduce energy intake and lose weight.
- Limit consumption of foods and drink high in sugar. High sugar foods also contain high amounts of energy.
- Reduce alcohol intake

Weight loss can be achieved even faster if you increase exercise. Exercise increases the number of calories the body uses, burns fat and builds muscle. Your body shape will change even if you are not overweight or obese. power-walking burns 21–36 kilojoules (5-9 calories) per minute and jogging burns 56 kilojoules (13 calories) a minute. Therefore, you can burn around 1200-2100 kilojoules (300-540 calories) in an hour by power-walking and around 3350 kilojoules (800 calories) in an hour by jogging. It is recommended that you engage in at least 30 minutes of moderate exercise 5 days per week to lose weight and maintain good health. This can be easily achieved if you get up just 30 minutes earlier each day to exercise, or by going for a brisk walk after work each day. Alternatively you could join a gym. It is likely that there is a 24 hour gym in your area, these gyms allow you to choose when you exercise, and the gym fees are often quite affordable. It may seem like you don't have time to exercise but if you plan ahead, finding 30 minutes most days to dedicate to exercise will be simpler than you think. Over time you may even begin to look forward to exercise sessions.

It is important not to over exert yourself during exercise. You can start slowly by using everyday events to increase your physical activity (e.g., parking the car 10 minutes away from work or taking the stairs). You should exercise at a level of exertion which is enough to increase your heart and breathing rate, but not so much that you cannot hold a conversation. If you have not exercised before or have not exercised in a long time it is recommended that you contact your physician before increasing your physical activity.

If you are overweight or obese, losing as little as 10% of your body weight can make a big difference in how you feel on a daily basis. Many of the adverse health effects of obesity can be reversed by losing weight. By losing weight you will find that you have more energy, greater mobility, greater fitness, less breathing difficulties, less aches and pains and you will sleep better. Weight loss and exercise will also help prevent several serious health problems including coronary heart disease, type II diabetes, high blood pressure and stroke. Further, weight loss and exercise increase the survival rates of those with obesity related diseases (e.g., type II diabetes).

Achieving weight loss can often seem like a slow and frustrating process. However, weight loss should be gradual (1kg per month) to ensure that you are losing fat, and not muscle or water mass. By making some simple lifestyle changes including reducing food intake, replacing high calorie foods with low calorie foods and engaging in regular exercise you can achieve significant weight loss over time.

Appendix AD: Measures Unique to Study 4

Study 4 was a continuation of Study 3 and utilised identical measures of attitudes, injunctive norms, descriptive norms, motivation to comply, perceived controllability, susceptibility, severity, self-efficacy, response-efficacy, intentions and health knowledge (see Appendix X). The measures below represent measures unique to Study 4 (see Chapter 7 for a fuller explanation of the methodology of Study 4).

Fear

How much did reading this brochure make you feel…..

Frightened

1 2 3 4 5 6 7
Not Very
At all much

Tense

1 2 3 4 5 6 7
Not Very
At all much

Nervous

1 2 3 4 5 6 7
Not Very
At all much

Anxious

1 2 3 4 5 6 7
Not Very
At all much

Uncomfortable

1 2 3 4 5 6 7
Not Very
At all much

Nauseous

1 2 3 4 5 6 7
Not At all — Very much

Disgusted

1 2 3 4 5 6 7
Not At all — Very much

Defensive Message Processing

Please list some thoughts (positive and/or negative) you had about the information and recommendations contained within the previous message:

____

____

____

____

____

____

Message Quality

This message was an accurate description of obesity and weight related illnesses.

1 2 3 4 5 6 7
Strongly Disagree — Strongly Agree

This message was an objective description of obesity and weight related illnesses.

1 2 3 4 5 6 7
Strongly Disagree — Strongly Agree

This message was clearly written.

	1	2	3	4	5	6	7	
Strongly Disagree								Strongly Agree

I clearly understood this message.

	1	2	3	4	5	6	7	
Strongly Disagree								Strongly Agree

I learned a lot about obesity and weight related illnesses from this message.

	1	2	3	4	5	6	7	
Strongly Disagree								Strongly Agree

The arguments presented in this message were strong.

	1	2	3	4	5	6	7	
Strongly Disagree								Strongly Agree

The arguments presented in this message were persuasive.

	1	2	3	4	5	6	7	
Strongly Disagree								Strongly Agree

Defensive Avoidance

When I was reading the message and looking at the pictures, my first instinct was to:

	1	2	3	4	5	6	7	
Want to Protect myself From weight gain								Not want to To protect Myself from Weight gain

When I was reading the brochure and looking at the pictures, my instinct was to:

	1	2	3	4	5	6	7	
Want to Think about Weight gain								Not want to Think about Weight gain

When I was reading the message and looking at the pictures, my first instinct was to:

	1	2	3	4	5	6	7	
Want to Protect myself From weight related illnesses								Not want to To protect Myself from Weight related illnesses

When I was reading the brochure and looking at the pictures, my instinct was to:

	1	2	3	4	5	6	7	
Want to Think about Weight related illnesses								Not want to Think about Weight related illnesses

Perceived Manipulation

This message was manipulative.

	1	2	3	4	5	6	7	
Strongly Disagree								Strongly Agree

This message was misleading.

	1	2	3	4	5	6	7	
Strongly Disagree								Strongly Agree

This message tried to manipulate me.

	1	2	3	4	5	6	7	
Strongly Disagree								Strongly Agree

This message was exploitative.

	1	2	3	4	5	6	7	
Strongly Disagree								Strongly Agree

Message Derogation

This message was exaggerated:

	1	2	3	4	5	6	7	
Strongly Disagree								Strongly Agree

This message was distorted:

	1	2	3	4	5	6	7	
Strongly Disagree								Strongly Agree

This message was overblown:

	1	2	3	4	5	6	7	
Strongly Disagree								Strongly Agree

This message was overstated:

	1	2	3	4	5	6	7	
Strongly Disagree								Strongly Agree

Appendix AE: A Case for Theoretical Integration: Combining Constructs From the Theory of Planned Behavior and the Extended Parallel Process Model to Predict Exercise Intentions

(Peer revived journal article)

Article

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A Case for Theoretical Integration: Combining Constructs From the Theory of Planned Behavior and the Extended Parallel Process Model to Predict Exercise Intentions

Jay A. Richards[1] and Martin P. Johnson[1]

Abstract

The present research investigated whether constructs of the Theory of Planned Behavior (TPB) and the Extended Parallel Process Model can be integrated into a model that can better explain intentions to exercise than the TPB constructs alone. A total of 336 participants completed measures of constructs from both theories and past exercise behavior. Hierarchical regression analyses revealed that attitudes, subjective norms, susceptibility, self-efficacy, and past behavior contributed unique variance to a model that predicted intentions to exercise. This model explained a greater proportion of the variance in exercise intentions than the TPB alone. Relationships between key variables of both models were also highlighted. Implications for theory and practice are discussed.

Keywords

health psychology, applied psychology, psychology, social sciences, Theory of Planned Behavior, Extended Parallel Process Model, theoretical integration, self-efficacy

It is widely acknowledged that regular exercise is associated with significant physiological and psychological benefits (Warburton, Nicol, & Bredin, 2006; Williams, 2001). However, in many westernized countries, less than half the population meet the minimum recommended physical activity requirements to achieve these health benefits (e.g., Australian Institute of Health and Welfare, 2010; Canadian Fitness and Lifestyle Research Institute, 2004; U.S. Department of Health and Human Services, 2003). As such, investigating ways of increasing exercise is a concern within health psychology (e.g., Hagger & Armitage, 2004; Hagger, Chatzisarantis, & Biddle, 2002a; Jones, Sinclair, Rhodes, & Courneya, 2004; Rhodes,& Nasuti,2011). The focus of this research is to identify the socio-cognitive factors that predict exercise intentions and behavior and provide a psychological account of how these factors determine behavior. Advancing theories in this way is important as successful manipulation of these factors via health promotion and communication may be useful in increasing the rates of exercise (Armitage & Conner, 2000).

Several models have been proposed to explain health behaviors. Two prominent models are the Theory of Planned Behavior (TPB; Ajzen, 1985, 1987) and the Extended Parallel Process Model (EPPM; Witte, 1992a). Both these models have been utilized to explain health behavior and intentions to engage in health behavior. Intention refers to the strength of the motivation or desire to engage in a particular behavior (Ajzen, 1991). Embedded in both models is the assumption that an individual's intention to engage in a particular health behavior is a proximal predictor of engagement in that behavior (Ajzen, 1991; Witte, 1994). As such, intentions are often used as the dependent variable of interest rather than actual behavior change (e.g., Abraham, Sheeran, & Henderson, 2011; Armitage & Conner, 2000; Godin & Kok, 1996; Hagger & Armitage, 2004; Hagger et al., 2002a). However, meta-analytic reviews suggest that neither model can explain all or even most of the variance in either behavioral intentions or health behavior change (e.g., Armitage & Conner, 2001; Floyd, Prentice-Dunn, & Rogers, 2000; Hagger et al., 2002a; Milne, Sheeran, & Orbell, 2000; Witte & Allen, 2000).

The literature primarily focuses on testing and utilizing existing theory to predict intentions and health behavior.

[1]School of Psychology, University of Newcastle, New South Wales, Australia

Corresponding Author:
Jay A. Richards, School of Psychology, University of Newcastle, University Drive, Callaghan, New South Wales 2308, Australia.
Email: Jay.Richards@uon.edu.au

Most often, one theory is selected to guide the choice of explanatory and outcome variables as if the other theories did not exist (Weinstein, 1993). Several researchers have lamented that there is a lack of research comparing competing theories or augmenting existing theories (Noar & Zimmerman, 2005; Ogden, 2003; Weinstein, 1993, 2007; Weinstein & Rothman, 2005; see Conner & Armitage, 1998; Dodge, Stock, & Litt, 2013; Dolman & Chase, 1996; Godin & Kok, 1996; Hagger et al., 2002a; Murray-Johnson et al., 2006, for some notable exceptions). Failing to compare or adjust existing theory means that it fails to naturally evolve, and as such our understanding of the socio-cognitive factors which determine health behavior change (and the mediators of health behavior change) does not improve (Weinstein & Rothman, 2005).

Several researchers have advocated taking a broader approach to predicting health behavior change by utilizing constructs from several theoretical perspectives—namely, theoretical integration (e.g., Hagger, 2009, 2010; Noar & Zimmerman, 2005). Bringing together the constructs with the most research support into a single model may yield a model which can explain a larger proportion of the variance than any single model alone. In many cases, the similarities between models of health behavior outweigh the differences (Hagger, 2009, 2010; Weinstein, 2007). Therefore, to reduce redundancy, only dissimilar models should be integrated. Two models which stand out as being different from one another, while still explaining a large proportion of the variance in health behavior change, are the TPB and EPPM.

Main Theoretical Perspectives

The TPB

According to the TPB (Ajzen, 1985, 1987, 1991), intentions and perceived behavioral control (PBC) are the proximal predictors of behavior. PBC refers to an individual's appraisal of how much control they have over adopting a particular behavior (Ajzen, 1991, 2002). This is determined by the individual considering the relevant resources they have available to them (i.e., requisite skills, social support, disposable income, etc.) and determining whether these are sufficient to overcome any barriers they anticipate in the performance of the behavior. Ajzen argues that if people believe that they will be successful in performing the behavior, they will be more likely to expend greater effort in adopting it (cf. Bandura, 1977, 1982, 1991). PBC is only likely to be an important predictor of behavior when behaviors are somewhat difficult or effortful to perform.

An individual's intentions are determined by their attitudes, subjective norms, and PBC. One's attitude toward a behavior refers to their appraisal (positive or negative) of their performing the behavior. Beliefs contributing to the formation of an attitude include the expected outcomes of engaging in the behavior (behavioral beliefs) and whether or not these outcomes are appraised as favorable or unfavorable (subjective evaluation; Ajzen, 1991). More positive attitudes are generated when expected outcomes are appraised as favorable. Subjective norms refer to the "perceived social pressure to perform or not perform the behaviour" (Ajzen, 1991, p. 188). The beliefs which determine subjective norms are the perceived likelihood that important people in the individual's life (e.g., friends, family members, medical professionals) will approve or disapprove of them engaging in a particular behavior, and their motivation to comply with each important other's wishes. According to the TPB, an individual is most likely to intend to perform health protective behaviors if they believe that (a) the behaviors are associated with favorable outcomes, (b) important others will approve, and (c) they have a high level of control over whether the behavior is adopted.

The TPB has received much research interest and has been found to be useful in explaining a variety of health behaviors including exercise (e.g., Armitage & Conner, 2001; Chatzisarantis, Hagger, Wang, & Thøgersen-Ntoumani, 2009; Godin & Kok, 1996; Hagger et al., 2002a; Hausenblas, Carron, & Mack, 1997; Murnaghan et al., 2010). Meta-analytic reviews have found that, on the whole, TPB explains 39% to 51% of the variance in behavioral intentions and 26% to 34% of the variance in health behavior (Armitage & Conner, 2001; Godin & Kok, 1996; Hagger, Chatzisarantis, & Biddle, 2002b; McEachan, Conner, Taylor, & Lawton, 2011). Therefore, although the TPB explains a large proportion of the variance in intentions and behavior, a significant amount of variance remains unexplained, suggesting that other predictors may exist which could explain this missing variance.

EPPM

The EPPM (Witte, 1992a) was designed to explain responses following exposure to a fear provoking health message—or a fear appeal (Witte, 1992a). Fear appeals generally consist of two elements: an explicit threat to health (e.g., "obesity increases your chances of heart disease") and a recommended response which will alleviate that threat ("exercise for 30 min 5 times per week"). However, many of the principles of the EPPM can be applied outside of a fear appeal context to explain how individuals are likely to respond to a perceived health threat (e.g., Rimal, 2001; Rimal, Böse, Brown, Mkandawire, & Folda, 2009; Rimal, Brown, et al., 2009; Rimal & Real, 2003; Turner, Rimal, Morrison, & Kim, 2006). Witte (1992a) theorized that responses to a health threat are a function of two appraisal processes: threat appraisal and efficacy appraisal (cf. Lazarus & Folkman, 1984). During the threat appraisal, individuals evaluate factors associated with the health threat, including feelings concerning the seriousness of a health threat (severity) and the likelihood of their being affected (susceptibility). The efficacy appraisal evaluates factors associated with a possible response to the threat including beliefs regarding the effectiveness of the response in reducing the health threat (response-efficacy) and a conviction that they can succeed in adopting the response (self-efficacy; cf. Bandura, 1977).

According to the EPPM, when a health threat is appraised as trivial (low severity) or irrelevant (low susceptibility), no fear is elicited and there is no motivation to respond to the fear appeal or continue to attend to its message. Thus, low threat messages are unlikely to lead to adaptive behavior change, regardless of the efficacy level (Witte, 1992a). However, when a health threat is appraised as harmful and relevant, fear is elicited (e.g., Maddux & Rogers, 1983; Rippetoe & Rogers, 1987; Rogers & Mewborn, 1976; Witte, 1992b, 1994; Witte & Allen, 2000). This fear motivates a consideration of possible responses to the health threat (efficacy appraisal; cf. Lazarus & Folkman, 1984). When a particular response is believed to be effective in alleviating the health threat (high response-efficacy) and easy to perform (high self-efficacy), the individual should become motivated to protect themselves from the health threat. This protection motivation should in turn stimulate acceptance of the response (i.e., adaptive attitude, intention, and behavior change; Witte, 1992a; Witte & Allen, 2000). Therefore, the EPPM predicts that when individuals perceive themselves to be susceptible to a severe health threat, and believe that adopting a particular behavior will be effective in alleviating that health threat, they are likely to hold positive attitudes and intend to adopt that behavior (see Witte, 1992a, for a fuller explication of the predictions of the EPPM).

Meta-analyses reveal that the five key variables (fear, severity, susceptibility, response-efficacy, and self-efficacy) of the EPPM each have positive associations with behavioral intentions and behavior change (Floyd et al., 2000; Milne et al., 2000; Witte & Allen, 2000). However, on the whole, effect sizes range from no effect to moderate (r = .07-.36; Milne et al., 2000). Self-efficacy, response-efficacy, and fear are generally stronger predictors of intentions and behavior than severity or susceptibility (Milne et al., 2000; Witte & Allen, 2000). Research findings suggest that perceptions of threat and efficacy account for 20% to 56% of the variance in intentions and 19% to 46% of the variance in health behavior (e.g., Hodgkins & Orbell, 1998; Maddux & Rogers, 1983; Melamed, Rabinowitz, Feiner, Weisberg, & Ribak, 1996; Plotnikoff & Higginbotham, 1995, 1998, 2002; Plotnikoff, Trinh, Courneya, Karunamuni, & Sigal, 2009; Rogers & Mewborn, 1976; Stanley & Maddux, 1986; Van der Velde & Van der Pligt, 1991). Although these findings are impressive, there is still a large proportion of the variance which is left unexplained by the model. Therefore, other variables may need to be considered if a more complete explanation of health behavior is to be realized.

The Case for Theoretical Integration

The present study aims to investigate the utility of taking a more comprehensive approach to predicting exercise intentions by utilizing constructs from two socio-cognitive models as predictors. The study will investigate whether adding perceived susceptibility, severity, self-efficacy, and response-efficacy to the TPB increases its explanatory power for predicting intentions to exercise. Hagger (2009) identified three arguments in favor of theoretical integration; it can eliminate gaps in theories, reduce redundancy, and increase parsimony. Both the TPB and EPPM contain different explanatory variables (Ajzen, 1985, 1987; Witte, 1992a), but each still explains a significant proportion of the variance in health behavior intentions (e.g., Armitage & Conner, 2001; McEachan et al., 2011; Witte & Allen, 2000). Therefore, it is possible that constructs from the EPPM may be able to fill explanatory gaps in the TPB, and vice versa, highlighting redundancies and unnecessary variables between theories. Therefore, theoretical integration may help streamline health promotion campaigns by identifying the most important variables to manipulate (Hagger, 2009). Other researchers agree that combining social-cognitive models may be a useful next step in the development of health behavior theory (Armitage & Conner, 2000; Fishbein et al., 2001; Maddux, 1993; Plotnikoff, Rhodes, & Trinh, 2009). To date, no research has attempted to combine variables from the TPB and EPPM to explain exercise intentions.

Integrating Ideas From the TPB and EPPM

Theorists have argued that self-efficacy and PBC are conceptually similar (Ajzen, 1985, 1991; Ajzen & Madden, 1986). However, Conner and Armitage (1998) argued that PBC is really a confounded measure of two constructs: one which is akin to self-efficacy (cf. Bandura, 1977, 1982; that is, ease with which the behavior can be adopted) and the other akin to locus of control (cf. Rotter, 1966; that is, whether a person believes that the behavior is under volitional control—perceived controllability). In support of this view, several studies have provided evidence for the conceptual distinction between perceived controllability and self-efficacy (e.g., Armitage & Conner, 1999a, 1999b; Dzewaltowski, Noble, & Shaw, 1990; Terry & O'Leary, 1995). Terry et al. argued that they should each be included as separate variables within the TPB framework. Adding self-efficacy to the TPB has been shown to increase the explanatory power of the model in terms of explaining exercise intentions and behavior (e.g., Hagger et al., 2002b; Povey, Conner, Sparks, James, & Shepherd, 2000; Yordy & Lent, 1993). Therefore, it is predicted that perceptions of self-efficacy and perceived controllability will be conceptually distinct and will each predict exercise intentions.

It has been argued that components of perceived threat within the EPPM (i.e., susceptibility and severity) may be incorporated into the TPB as beliefs contributing to one's attitudes (Maddux, 1993; Rogers & Prentice-Dunn, 1997). Susceptibility may be conceptualized as a perceived outcome of not engaging in the healthy behaviors (i.e., "if I maintain my sedentary lifestyle I may develop heart disease”). Perceptions of severity could be conceptualized as unfavorable evaluations of developing a health problem (i.e., “heart disease is a serious and life-threatening”; Maddux, 1993). Beliefs about one’s susceptibility to a severe illness should lead to more negative attitudes concerning the current unhealthy behavior (cf. Rogers, 1983; Rogers et al., 1997) and as a result more positive attitudes about proposed changes in behavior, especially if these are believed to be effective in alleviating the health risk. Therefore, beliefs about the efficacy of a particular response in alleviating the health risk (i.e., response-efficacy) could also be conceptualized as a behavioral belief concerning that response. It can be safely assumed that this belief would be favorable as it is unlikely that improving one’s health would be viewed as unfavorable. This suggests that the EPPM constructs of susceptibility, severity, and response-efficacy may be determinants of attitudes within the TPB. As such, it is predicted that the effect of these variables on intentions will be mediated by attitudes.

Ajzen (1991, 2011) argued that a measure of past behav- ior may be used to test the sufficiency of the TPB. If the TPB is sufficient, prior behavior (or any other variable) should not add significant unique variance to the model. However, meta-analytic reviews of the TPB consistently suggest that past health behavior is a relatively strong and consistent predictor of both intentions and behavior even after controlling for the effects of attitudes, subjective norms, PBC, and intentions (e.g., Conner & Armitage, 1998; Hagger et al., 2002b; McEachan et al., 2011; Ouellette & Wood, 1998; Sandberg & Conner, 2008). The addition of past behavior to the TPB also significantly attenuates the effects of intentions and PBC on behavior, and the effects of attitudes, subjective norms, and PBC on intentions (McEachan et al., 2011). Therefore, the TPB may not be sufficient to predict intentions and behavior, suggesting that important socio-cognitive predictors may have been left out of the model.

Ouellette and Wood (1998) argued that when a behavior is performed frequently within similar contexts, the performance of that behavior can become automatic or habitual—occurring independent of the conscious deliberation posited by the TPB (cf. Ronis, Yates, & Kirscht, 1989). Therefore, if an individual has made a habit of exercising in the past, they are likely to do so in the future. Ajzen (2002) offered an alternative explanation arguing that the determinants of past behavior are likely to affect future behavior and future intentions. As such, assuming these determinants do not change significantly over time, past behavior will necessarily correlate with intentions. Ajzen suggested that the link between past behavior and intentions is spurious and should be mediated by other predictors of intentions. It is possible that this effect may be due to past exercise raising individual’s self-efficacy with respect to exercising in the future. Engaging in exercise demonstrates empirically that one should be able to exercise again (cf. Bandura, 1977, 1982). Therefore, it is predicted that self-efficacy will mediate the effect of past exercise behavior on intentions to exercise.

Taken together, we propose a model in which exercise will be determined by attitudes, subjective norms, self-efficacy, and perceived controllability. Severity, susceptibility, and response-efficacy will have no direct effect on intentions but will exert their influence via attitudes. Past behavior will be used to test the sufficiency of the model and its effect on intentions should be mediated by self-efficacy.

Method

The results reported here are preliminary findings from a larger study investigating the predictors of health behavior change around obesity, diet, and exercise. The present research will report only the results pertaining to the predictors of exercise.

Participants

A total of 336 participants (265 females, 71 males) were recruited for the study. The mean age of participants was 25.28 years (*SD* = 11.01). Most participants were recruited from the undergraduate psychology program of a university in New South Wales, Australia, via an online advertisement (*N* = 284), the remaining 52 participants were recruited from the general public via advertisement posters. Undergraduate participants received partial course credit for their participation, whereas the general public participants received no incentives or rewards.

Measures

With the exception of the demographics measure, all measures used in this study have been adapted from those used in previous research testing the TPB (e.g., Chatzisarantis et al., 2009; Fishbein & Ajzen, 2010; Jones et al., 2004; Payne, Jones, & Harris, 2004; Rivis & Sheeran, 2003) and the EPPM (e.g., Cho, 2003; Witte, 1994; Witte, Cameron, McKeon, & Berkowitz, 1996). The phrasing of the items remained similar but was adapted to fit the health context of this study.

All items corresponded to exactly the same specific behavior (“exercising 30 min a day, 5 days per week”) over a specific time frame (“the next month”) following recommendations from Ajzen (1991). With the exception of the demographics measure (which was presented first) and the attitudes and intentions measures (which were presented last), the items from the remaining scales were presented in random order. All measures except the attitudes measure utilized a 7-point categorical scale anchored by *strongly agree* and *strongly disagree*. The attitudes measure utilized a 7-point semantic differential scale. Items pertaining to each of the measures were summed, then averaged by dividing the total by the number of items, such that each measure was scored out of seven. The experiment was performed online on the university server. The survey program was used to randomize the items.

Demographics/past behavior. Age, sex, and information pertaining to relevant health behaviors (e.g., frequency of exercise, minutes spent exercising per week) were gathered using a demographics measure. Past exercise behavior was determined by asking participants how many exercise sessions they had completed over the past month and what was the average length of these exercise sessions. These values were used to calculate the time (in hours) spent exercising per week. This was used as a measure of past behavior. As a guide, participants were provided with the following definition of exercise: "Exercise is defined as physical activity that is planned, structured, and repetitive for the purpose of conditioning any part of the body or increasing physical fitness."

Attitudes. Participant's attitudes were measured using a four-item semantic differential scale. Participants indicated the extent to which engaging in exercise during the next month would be good/bad, enjoyable/not enjoyable, unwise/wise, and beneficial/not beneficial. The internal consistency for this measure was high ($\alpha = .84$).

Subjective norms. Subjective norms were measured using a two-item scale. Participants indicated the extent to which they believe that important others would "approve" or "recommend" that they engage in exercise during the next month. The internal consistency for this measure was acceptable ($\alpha = .77$).

Perceived controllability. Perceived controllability was measured using a two-item scale. Participants indicated the extent to which they believe that they have control over engaging in exercise during the next month (i.e., "It is mostly up to me [I have control over] whether or not I exercise for at least 30 min per day during the next month"). The internal consistency for this measure was high ($\alpha = .89$).

Susceptibility. Susceptibility was measured using a three-item scale. Participants indicated whether they believed themselves to be "at risk of," "likely to develop," or "possibly affected by" the adverse health effects associated with weight gain. The internal consistency of this scale was high ($\alpha = .96$).

Severity. Severity was measured using a three-item scale. Participants indicated the extent to which they believed that the adverse health effects associated with weight gain are "severe," "serious," and "significant." The internal consistency of this scale was acceptable ($\alpha = .78$).

Self-efficacy. Self-efficacy was measured using a six-item scale. Items included the following: "Exercising for 30 minutes per day 5 days per week during the next month will be easy (difficult, inconvenient [reverse scored]) for me" and "I am able to (I am certain I could, If I wanted to I could easily) exercise for 30 min . . ." The internal consistency for the scale was high ($\alpha = .93$).

Response-efficacy. Response-efficacy was measured using a three-item scale. Participants indicated the extent to which they believe that engaging in exercise "works" and "is effective" in preventing weight-related health problems. The internal consistency for this measure was high ($\alpha = .89$).

Intentions. The dependent variable, intentions, was measured using a two-item scale. Items included the following: "I intend to exercise for at least 30 min per day, 5 days per week during the next month" and "I will exercise . . ." The internal consistency for this measure was high ($\alpha = .88$).

Data Analysis

Principal components analysis was utilized to ascertain whether self-efficacy and perceived controllability were distinct constructs. Pearson's correlations were utilized to investigate the intercorrelations between the psychological variables used in this study. Multiple regression was utilized to investigate the predictors of attitudes. Hierarchical regression analysis was utilized to uncover a significant model of factors that predict exercise intentions. This analysis was performed by entering four different blocks of predictors into a regression equation predicting intentions. Block 1 consisted of the TPB variables (i.e., attitudes, subjective norms, and perceived controllability). Block 2 contained self-efficacy. Block 3 consisted of the remaining variables from the EPPM (i.e., susceptibility, severity, and response-efficacy). Block 4 contained past exercise behavior. Hierarchical regression was also utilized to investigate whether the effect of severity, susceptibility, and response-efficacy on intentions is mediated by attitudes, and whether the effect of past behavior on intentions is mediated by self-efficacy.

Results

Principal Components Analysis

As PBC and self-efficacy are conceptually similar, there was a need to ensure that the items used were indeed representing two separate constructs, rather than one overarching construct. Therefore, a principal components analysis with Varimax rotation was performed on the perceived controllability and self-efficacy items. Kaiser's criterion (eigenvalue > 1) was utilized to determine how many factors to extract. The first factor (rotated: eigenvalue = 4.00, variance explained = 49.95%; unrotated: eigenvalue = 5.13, variance explained = 64.17%) was found to all six of the self-efficacy items loading on it (with factor loadings greater than .5; Kline, 1994). The second factor (rotated: eigenvalue = 2.23, additional variance explained = 27.87%; unrotated: eigenvalue = 1.09, additional variance explained = 13.65%) had

Table 1. Descriptive Statistics and Correlation Matrix for Exercise Intentions and All Measured Predictors.

	M	*SD*	1	2	3	4	5	6	7	8
1. Intentions	4.38	1.91								
2. Attitudes	5.92	1.05	.48**							
3. Subjective norms	4.68	1.05	.31**	.37**						
4. Controllability	5.74	1.37	.34**	.28**	.26**					
5. Susceptibility	2.79	1.83	.02	−.05	.08	−.22**				
6. Severity	5.33	1.41	.02	.11	.20**	−.01	.27**			
7. Self-efficacy	4.47	1.64	.65**	.48**	.33**	.56**	−.19**	.02		
8. Response-efficacy	5.94	1.02	.12*	.27**	.35**	.35**	.03	.21**	.21**	
9. Past behavior[a]	2.61	2.62	.38**	.24**	−.02	.20**	−.16**	.01	.44**	.04

[a]Hours of exercise performed each week.
*$p< .05$. **$p< .01$.

both of the perceived controllability items loading on it. No further factors were extracted (eigenvalues < 1). As predicted, these results indicate that the self-efficacy and perceived controllability items represent distinct constructs. However, the percentage of additional variance explained by the second factor was small, indicating that this factor is relatively weak. Nevertheless both factors were retained to investigate the unique effect of self-efficacy and perceived controllability on intentions. The total variance explained by the two-factor rotated solution was 78.21%. The correlation between the resultant measures of perceived controllability and self-efficacy was $r = .51$.

Descriptive Statistics and Correlations

Descriptive statistics and correlation coefficients for each of the psychological variables are presented in Table 1. Pearson's correlations coefficients revealed a strong positive association between self-efficacy and intentions; moderate positive associations were observed between exercise intentions and attitudes, subjective norms, perceived controllability, and past behavior. Exercise intentions were also weakly associated with response-efficacy. Contrary to predictions, no significant bivariate correlation was found between exercise intentions and susceptibility or severity. As predicted, attitudes were positively associated with response-efficacy, and past behavior was positively associated with self-efficacy. However, contrary to predictions, neither severity nor susceptibility was associated with attitudes. Furthermore, a moderate positive correlation was found between self-efficacy and perceived controllability. Other intercorrelations were generally weak or non-significant. However, moderate positive associations were recorded between attitudes and subjective norms, attitudes and self-efficacy, subjective norms and self-efficacy, subjective norms and response-efficacy, and perceived controllability and response-efficacy.

Prediction of Attitudes

Multiple regression analysis was utilized to investigate the effect of susceptibility, severity, and response-efficacy on attitudes. A significant model which explained 7.29% of the variance in attitudes was found, $F(3, 332) = 9.77$, $p< .001$ (see Table 2). Response-efficacy was the only variable found to explain a significant proportion of the variance in attitudes. Contrary to predictions, the effects of both susceptibility and severity were non-significant.

Predictors of Exercise Intentions

The first step in the hierarchical regression analysis revealed that attitudes, subjective norms, and perceived controllability each contributed to the prediction of exercise intentions, $F(3, 332) = 44.60$, $p< .001$ (see Table 2). Self-efficacy was found to explain a further 16.21% of the variance, $\Delta F(1, 331) = 97.60$, $p< .001$. Following the addition of self-efficacy to the model, the effect of both subjective norms and perceived controllability was attenuated to non-significance. The remaining EPPM predictors explained a further 1.90% of the variance in intentions, $\Delta F(3, 328) = 4.89$, $p< .005$. However, perceived susceptibility was the only variable to explain a significant proportion of the remaining variance. Finally, past exercise behavior was also found to be a significant predictor of intentions, explaining a small proportion of the remaining variance, $\Delta F(1, 327) = 8.95$, $p< .005$. The overall model explained 47.46% of the variance in exercise intentions.

Given the zero-order bivariate relationship between susceptibility and intentions ($r = .02$, $p = .78$), it is possible that susceptibility acted as a suppressor variable. Suppressor variables generally increase the prediction of an outcome variable of interest by increasing the predictive validity of one or more predictor variables (cf. MacKinnon, Krull, & Lockwood, 2000; Pandey & Elliot, 2010; Tzelgov & Henik, 1991). This occurs as the suppressor variable suppresses variance in one or more of the predictor variables, which is irrelevant to the outcome variable. Investigation of the correlation matrix revealed that susceptibility was negatively associated with self-efficacy ($r = −.19$, $p< .001$). Furthermore, a small increase in the beta-weight for self-efficacy was found following the inclusion of susceptibility in the model. MacKinnon et al. demonstrated that suppression and

Table 2. Hierarchical Regression Analysis of the Predictors of Attitudes and Exercise Intentions.

	β	*t*	Adjusted R^2
Attitudes			
Step 1: Susceptibility	−.07	−1.28	.07***
Severity	.07	1.26	
Response-efficacy	.26	4.77***	
Intentions			
Step 1: Attitudes	.38	7.48***	.28***
Subjective norms	.12	2.29*	
Controllability	.20	4.03***	
Step 2: Attitudes	.27	4.46***	.44***
Subjective norms	.07	1.56	
Controllability	−.03	−0.52	
Self-efficacy	.52	9.88***	
Step 3: Attitudes	.22	4.77***	.46**
Subjective norms	.08	1.61	
Controllability	.02	0.42	
Self-efficacy	.54	10.16***	
Susceptibility	.14	3.34**	
Severity	−.05	−1.25	
Response-efficacy	−.08	−1.69	
Step 4: Attitudes	.22	4.52***	.47**
Subjective norms	.10	2.18*	
Controllability	.03	0.53	
Self-efficacy	.47	8.36***	
Susceptibility	.15	3.57***	
Severity	−.06	−1.40	
Response-efficacy	−.08	−1.67	
Past exercise behavior	.14	2.99**	

$^*p< .05$. $^{**}p< .01$. $^{***}p< .001$.

mediation are mathematically equivalent. As such, tests of mediation, such as the Sobel test, can also be applied to identifying suppressor effects (Preacher & Hayes, 2004). A Sobel test revealed that the inclusion of susceptibility in a model regressing intentions from self-efficacy significantly increased the predictive validity of self-efficacy ($Z = −2.44$, $p< .05$). This indicates that susceptibility acted as a suppressor variable within the regression equation, suppressing variance in self-efficacy, which was irrelevant to intentions (classical suppression; Horst, 1941; Pandey &Elliot, 2010; Tzelgov & Henik, 1991). These findings suggest that exercise intentions are not associated with the shared variance between self-efficacy and susceptibility.

Mediation Analyses

It was predicted that attitudes would mediate the relationship between response-efficacy and intentions, susceptibility and intentions, and severity and intentions. Following Baron and Kenny (1986), variables were only entered as potential mediators when (a) the predictor was correlated with the mediator (attitudes), (b) the predictor was correlated with the dependent variable (intentions), and (c) the mediator was correlated with the dependent variable. Investigations of correlation matrix revealed that attitudes qualified as a mediator for the effect of response-efficacy on intentions. Both susceptibility and severity did not correlate with intentions. This suggests that neither susceptibility nor severity exert any direct or indirect effect on intentions.

Attitudes were found to fully mediate the effect of response-efficacy on intentions to lose weight. Response-efficacy was found to be a predictor of intentions in the first step of a hierarchical linear regression analysis ($β = .15$, $p< .01$). However, following the addition of attitudes into the equation, the effect of response-efficacy was attenuated to non-significance ($β = .07$, $p = .20$). A Sobel test of mediation revealed that the indirect effect of response-efficacy on intentions was significant ($Z = 3.68$, $p< .001$; cf. Preacher & Hayes, 2004). These findings support the prediction that attitudes will mediate the effect of response-efficacy on intentions.

A similar analysis was performed to investigate whether self-efficacy mediated the relationship between past exercise behavior and intentions. Investigation of the correlation matrix revealed that self-efficacy qualified as a mediator. Hierarchical regression analysis revealed that adding self-efficacy to a model regressing exercise intentions from past exercise behavior attenuated the effect of past exercise behavior to non-significance—β reduced from .26 ($p< .001$) to .02 ($p = .63$), $Z = 6.62$, $p< .001$. These findings support the prediction that the effect of past behavior on intentions will be mediated by self-efficacy.

Discussion

The current study aimed to investigate whether there is utility in combining constructs from the TPB and EPPM to predict exercise intentions. Results suggested that although the TPB is a useful model for predicting exercise intentions, the addition of variables from the EPPM increased its explanatory power. The identified integrated model suggested that individuals are most likely to intend to exercise when they believe that engaging in exercise will lead to desirable outcomes, believe that others will approve of their exercising, believe that they are able to exercise effectively, and believe that they are susceptible to weight-related illnesses. The identified model closely resembles the structure of the TPB, the only differences being that only the self-efficacy component of PBC was an important predictor and perceived susceptibility explained additional variance. The proportion of the variance explained by the model is comparable with that found in meta-analytic reviews of TPB research relating to health behaviors (e.g., Godin & Kok, 1996; Hagger et al., 2002; McEachan et al., 2011). The addition of susceptibility and past behavior only added a further 3%, suggesting that these variables are far less important predictors of exercise intentions than attitudes and self-efficacy.

Self-Efficacy and Perceived Controllability

The results of this study lend further support for the separation of the PBC construct into two component parts: self-efficacy and perceived controllability. These findings are consistent with a large number of studies, which have provided evidence for the conceptual distinction between self-efficacy and perceived controllability (e.g., Armitage & Conner, 1999a, 1999b; Hagger & Chatzisarantis, 2005; Povey et al., 2000; Terry & O'Leary, 1995; White, Terry, & Hogg, 1994). Although there is evidence to suggest that both self-efficacy and PBC may contribute unique variance to models of health behavior intentions (e.g., Hagger et al., 2002; Yordy & Lent, 1993), this finding was not borne out in the current study. In the present study, the effect of perceived controllability on intentions was attenuated to non-significance following the addition of self-efficacy to the model. However, these results echo other previous findings which suggest that self-efficacy is a stronger predictor of intentions than perceived controllability (e.g., Povey et al., 2000; Sparks, Guthrie, & Shepherd, 1997; Terry & O'Leary, 1995). These findings suggest that individual's belief that they are capable of engaging in exercise is a more important predictor of exercise intentions than their belief that they have control over whether they engage in exercise.

Attitudes

Attitudes were found to be a predictor of intentions lending support to the predictions of the TPB. Attitudes are consistently a strong predictor of intentions in TPB research (cf. Godin & Kok, 1996; Hagger et al., 2002; McEachan et al., 2011). As predicted, response-efficacy was found to be a significant predictor of attitudes. However, contrary to predictions susceptibility and severity were non-significant predictors. These results support previous findings in the literature, suggesting that perceptions of efficacy (but not threat) are associated with more positive attitudes concerning health behaviors (e.g., Ruiter, Verplanken, Kok, & Werrij, 2003; Witte, 1992b, 1994). Attitudes were also found to fully mediate the effect of response-efficacy on intentions. According to the EPPM, individual's perceptions of response-efficacy can be manipulated through health messages highlighting the effectiveness of certain responses (e.g., Cho, 2003; Witte, 1992b, 1994; Witte & Allen, 2000). Therefore, a health message may increase perceptions of response-efficacy with respect to a recommended response, which determines one's attitudes concerning that response, which in turn determines intentions and behavior. This mediation model is consistent with the results of this study and the predictions of both the TPB and EPPM. As such, it may be possible to apply the TPB to the prediction of health message responsiveness. Investigating this possibility would be an interesting venture for future research.

Other predictors of exercise intentions included subjec- tive norms, susceptibility, and past behavior. Importantly, these variables were much weaker predictors of intentions. Several researchers have noted that subjective norms are often a weaker predictor of intention than either attitudes or PBC as evidenced by effect sizes in meta-analytic reviews and regression weights (e.g., Ajzen, 1991; Armitage & Conner, 2001; Conner & Armitage, 1998; Hagger et al., 2002; Hausenblas et al., 1997; McEachan et al., 2011; Rivis & Sheeran, 2003). Findings also suggest that perceptions of threat are weaker predictors of exercise intentions than efficacy perceptions (e.g., Lippke & Plotnikoff, 2009; Plotnikoff & Higginbotham, 1995; Plotnikoff & Trinh, 2010; Plotnikoff, Rhodes, & Trinh, 2009; Plotnikoff, Trinh, et al., 2009). Furthermore, susceptibility was identified as a suppressor variable increasing the predictive validity of self-efficacy. This suggests that the positive effect of self-efficacy on intentions is not at all attributable to the finding that those with high self-efficacy tend to report lower susceptibility. The effect of susceptibility was significant because it removed variance in self-efficacy which was unrelated to exercise intentions; rather than susceptibility exerting any direct impact on intentions.

Past exercise behavior was also found to be a predictor of exercise intentions. However, it only added a very small amount of the residual variance in intentions after controlling for the effect of the other psychological variables. Nevertheless, this suggests that the current model may be inadequate and other psychosocial constructs may need to be considered to optimize the prediction of exercise intentions (cf. Ajzen, 1991, 2011). However, the results of this study suggest that the effect of past exercise behavior on intentions is mediated by self-efficacy. This finding supports Ajzen's (2002) contention that the effect of past behavior on future intentions is spurious and should be mediated by other predictors of intentions. The results of the present study suggest that engaging in exercise in the past increases one's belief that they could continue to exercise in the future, which in turn predicts intentions to exercise.

It is important to note that variables from both the TPB and EPPM contributed to the model. Furthermore, several of the psychological variables from both models either did not predict exercise intentions (susceptibility and severity) or did not contribute unique variance to its prediction (perceived controllability, response-efficacy). This suggests that neither model provides a complete or optimal account of exercise intentions. Despite a large number of variables being used as predictors, a relatively simple five-factor model of intentions emerged. This suggests that theoretical integration can be used to identify variables that are weakly or spuriously associated with an outcome variable of interest (cf. Hagger, 2009, 2010). The results of this study further suggest that theoretical integration can be utilized to develop our understanding of the relations between constructs from separate models. With the large number of extant models being applied to health behavior, many of which making very similar or identical predictions, it is important to identify and understand connections between these models. This allows for identification of general cross-theoretical principles of predicting health behavior (Maddux, 1993; Noar & Zimmerman, 2005). This is desirable as it serves to simplify and reconcile the health behavior literature as a whole (cf. Hagger, 2009; Maddux, 1993). Reconciliation of the health behavior literature may be achieved through further research, which employs theoretical integration (cf. Hagger, 2009, 2010).

A limitation of the present research is the use of intentions as the primary outcome measure in lieu of a specific measure of behavior. Although many socio-cognitive models (includ- ing TPB and EPPM) assume that intentions are the proximal predictor of behavior, this assumption has often been called into question (e.g., Rhodes & Dickau, 2012; Rhodes, Plotnikoff, & Courneya, 2008; Sheeran, 2002). In a review of the relevant literature, Sheeran found that intentions explained, on average, only 28% of the variance in behavior. This suggests that individuals self-reported intentions do not necessarily translate into behavior. Future research could employ a longitudinal design to ascertain the extent to which intention predicts subsequent behavior within an integrated model.

Conclusion

The present study suggests that exercise intentions can be predicted by attitudes, subjective norms, self-efficacy, and past behavior. Several other psychological variables that have been shown to be robust predictors of behavioral intentions in previous research were investigated but did not contribute unique variance to the model. Furthermore, an interesting relationship between response-efficacy and attitudes was uncovered, which suggests that the TPB may be applied to the prediction of responses to health messages. Taken together, these findings suggest that theoretical integration can highlight variables that are weakly or spuriously associated with health behavior intentions. Furthermore, it can develop our understanding of how constructs from different theoretical models can be combined to predict intentions. The authors advocate using theoretical integration as a methodology to improve understanding of the determinants of health behavior.

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Author Biographies

Jay A. Richards is a clinical psychologist in training and PhD (Clinical Psychology) candidate at the University of Newcastle, Australia. His research interestsinclude developing a theoretical understanding of health promotion effectiveness and the psychological determinants of health behaviour.

Dr Martin P. Johnson is a Senior Lecturer and Health Psychologist specialising in Clinical Health. He works as both an academic and clinician. His research interests include a theoretical understanding of health behaviour change, men’s health and reproductive health psychology.