Kick-Smart Education: Promoting academic achievement, fitness and wellbeing in primary school-aged children through martial arts

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Declarations

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I hereby certify that the work embodied in the thesis is my own work, conducted under normal supervision. The thesis contains no material which has been accepted, or is being examined, 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. 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 and any approved embargo.

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Statement of Authorship

I hereby certify that the work embodied in this thesis contains a series of published paper/s/scholarly work/s of which I am a joint author. I have included as part of the thesis a written statement, endorsed by my supervisors, attesting to my contribution to the joint publication/s/scholarly work.

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Statement of Contribution of Others

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I, Associate Professor Narelle Eather, attest that Research Higher Degree candidate Louis Burt contributed substantially in terms of study concept and design, data collection and analysis, and preparation of the following thesis.

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Publications Arising from this Thesis

The following four peer-reviewed publications form the foundations of this thesis by publication, and appear throughout this document in the following order:

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Preface

This thesis stemmed from a passion for teaching and involvement in many martial arts over my lifetime. I began my martial arts training at six years of age, studying Taekwon-Do in my primary school hall, and progressed through to a grade very close to black belt by the end of primary school. I then became slightly demotivated and sought something based more closely on the reality of self-defence situations. Within a year, I found Australasian Defendo – Close Quarters Combat, in which I trained through my pre-teen and early teenage years. It is here that I was introduced to striking skills from boxing and Muay Thai, grappling skills derived from Japanese Jiujutsu and, Judo and Brazilian Jiu-Jitsu, the weapon skills of Kali and Kombatan, as well as some principles of unarmed combat from Canadian police and S.W.A.T. teams. At the age of 17, I joined a Freestyle Karate club. I trained multiple times a week, attaining my black belt after three years which also coincided with my first year at university. During these three years, I also became involved in Extreme Martial Arts (XMA). I competed in my first Karate tournament in 2011, where I won first place against a state XMA champion. I then became more involved in competitive martial arts competition, achieving 'Number One' ranking in Australasia for XMA and 'Number 4' in Australasia in point sparring against brown and black belts before I had even achieved my own black belt rank. I remained undefeated in all contact Karate bouts throughout this time and won several grappling competitions, including the Sydney Sambo championships and a few novice Brazilian Jiu-Jitsu matches. During my time as a senior at both the Defendo and Karate schools, I started teaching skills to students of lower grades. This is where I first became exposed to teaching and found my passion in passing on knowledge. I went straight from high school to begin the undergraduate degree that I would later graduate in January 2017 – Bachelor of Teaching (Early Childhood and Primary) (Honours). During this time I became involved in the university Taekwon-Do team, holding the position of Vice-President from 2014 to 2015 and teaching weekend classes, as well as filling in when the head instructor was away during the week. During my time at university, I was introduced to the Greek martial art of Pankration through a connection formed between my Karate instructor and the owner of 'The Fight Lab' in Sydney. I was offered the chance to become an affiliate instructor of Pankration, pending a training session and test with the Pankration instructor to determine whether I had the pre-existing skills needed. Within six months, I had taught my first Pankration/Mixed Martial Arts (MMA) class at my Karate club. I further fell in love with teaching, as I had the opportunity to put some of what I was learning at university into practice in my martial arts classes. I have since earned my black belt in Pankration and fought internationally on the Australian Pankration team. During 2013, I was also introduced to Kinetic Fighting – Integrated Combat (KEF-IC) through a seminar I was invited to by an old Defendo instructor. I immediately found a passion for the realistic and battle-proven techniques and concepts taught by former Australian Commando Sgt Paul Cale. Over the last 10 years I have attended multiple KEF-IC events, including overnight training camps in various states, and have had my combatives and resilience formally tested by current and former special forces operators, achieving instructor level in KEF-IC. This has provided me with opportunities to train and assist in the instruction of military personnel hand-to-hand combat, as per the KEF-IC / Army Combatives Program (ACP) doctrine.

In 2016, I was accepted into the graded honours pathway of my bachelors degree, where I was introduced to my soon-to-be honours supervisor Robert Parkes. As well as being a highly accomplished teacher and academic, Robert was a life-time martial artist. During my honours research, I began training in Kali under his instruction and later achieved the rank of 'Instruktor' (black belt) in this art. My honours thesis examined the links between martial arts pedagogical theories and academic pedagogical theories. I was then encouraged to consider applying for a PhD scholarship.

After a single term of teaching in primary schools, I was offered a permanent targeted graduate position at Cessnock Public School. I accepted this position and as of 2023 I am still working at this school. After teaching at this school, and a number of other schools in low socio-economic areas, I felt that a belief I already held was being reinforced daily – martial arts can provide benefits to school-aged students over and above simple athletic ability and self-defence capabilities – and this led me to investigate this theory through my PhD studies. I was offered a full-time PhD Scholarship through the University of Newcastle and was able to commence my PhD journey in 2018, taking leave from the NSW Department of Education. During my PhD candidacy I have continued to teach in various casual, part-time and full-time capacities in primary school settings, fulfilling roles such as full-time classroom teacher as well as Personal Development Health and Physical Education (PDHPE) coordinator, music teacher, and sport and excursion organisation team member. Additionally, I have taught on a number of tertiary education courses for undergraduate teachers, with a focus on PDHPE content.

It is these experiences and expertise that form the lens though which the Kick-Smart program was developed, and this thesis was written.

Acknowledgements

First and foremost, I would like to express my sincerest gratitude to my supervisors, Associate Professor Narelle Eather and Doctor Nicholas Riley. These highly driven intellectuals have made themselves available to me throughout, and even prior to the commencement of, my doctoral journey. In both of their unique, completely irreplaceable ways, they have taught me so much that I will take with me throughout the remainder of my career and indeed my life.

Narelle, thank you for your positivity and high levels of energy. Thank you for your reliable, honest input and expert guidance, as well as the caring, hard truths wherever needed. Each hard truth or 'kick up the "academic rear end"' sucked as much as being kicked by a professional fighter, but each one was necessary and came from a place of care and concern. Although I may not have shown it at the time, I am truly thankful for this and every other part of having you as a supervisor.

Nick, you have provided open, often humorous and uncensored, highly experienced input to countless areas of my PhD journey, as well as parts of my undergraduate degree. Since having you as a lecturer in my first year of university almost a decade ago, I have always felt I was able to come to you for guidance as I feel we share much in the way of our approaches to teaching – I believe my pedagogy has largely been shaped by your influence as a male teacher role model throughout my teaching career. Thank you for everything.

Robert – although you are no longer part of my PhD journey, you were not only a highly experienced supervisor, but also a martial arts mentor, training partner and colleague. I would not have undertaken post-graduate study, nor made the same progress through my PhD journey, were it not for your guidance. Thank you.

I am extremely grateful for the amazing support I have had from my family. I would like to acknowledge my utmost gratitude and love for my father Garry, who has been and continues to be my biggest supporter in all areas of my life. Dad, over the past several years you have not only provided unrelenting support for my studies, but have been a constant source of compassion, motivation and strength over some of the most challenging years of both of our lives. Your relentless and selfless nature has guided and supported me throughout many challenges in my life, from academia and my career in education, to martial arts gradings and competitions through to break ups, renovations and real estate to name a few. You have seen me at my highest of highs and my lowest of lows. I would not be the man I am today without you. Although we have our scars and faults, I am proud of the men we have both become. You have often said to me *'Bite off more than you can chew, and chew like crazy!'* I'm glad I listened.

People often say 'You can't choose your family'. I refuse to agree with that, and would like to acknowledge (in alphabetical order) Anthony, Bryan, Burt, Melanee, Nigel, Ryan, and Sarah. To varying degrees, these individuals provided irreplaceable support over the years of my PhD studies (and beyond). Some of these people may never read this body of work, but their input and support during these years deserves acknowledgement and thanks. Dudes and 'dudettes' – thank you for the love, the compassion, the 'family dinners', the boys' nights, the laughter, the tears, the training sessions, the help moving house(s), the adventures, the spaces to store my possessions on short notice, the check-ins during stressful times, the safe places to vent my anger or frustration, and the beds to sleep on when no others were available. Thank you for believing in me and for being several candles to keep me on the right path during some of my darkest days. You not only stood behind me through this time, but stood beside me and in front of me at times. I hope that I have and will continue to return such kindness, empathy, compassion and friendship. I strive to emulate the best in each of you, as the world is a better place for having each of you in it. '*Word*.'

Additionally, thank you to the following individuals. Your knowledge, skills and teachings have allowed me to pursue and teach the content of this body of work.

Aaron Patterson, Australasian Defendo C.Q.C.; Bill Johnson, Australasian Defendo C.Q.C.; Clancy Roberts, Kinetic Fighting Integrated Combat (KEF-IC); Darrel Sparke, UoN Taekwon-Do; Gene 'Geno' DeCrewis, Gracie Barra (GB) Brazilian Jiu-Jitsu; Gustavo 'Guga' Pinto, GB Brazilian Jiu-Jitsu; Jacob Marks, Third Eye Muay Thai & Heng Kuai; Kon Pappy, The Fight Lab; Nigel Richardson, Yun's Takewon-Do; Paul Cale, KEF-IC; Peter Kirkwood, Kaizen Ryu Freestyle Karate

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In loving memory of:

Ronald Bendeich

Paul Christensen

Sam Phillips

Marie Hall

Although each of you passed somewhat unexpectedly during my PhD studies, I am eternally grateful of having such wonderful people in my life, even if it was not for as long as I had anticipated. I hope that this PhD honours the memory of each of you.

My pop Ron always had a way with words (some may argue too many words at times). Ever since I was a child, I remember him saying to me and other family members, whenever someone would start a sentence with '*I wish…'*

'*Wish in one hand, sh** in the other – see which one fills up faster.'*

As silly and sarcastic this quote of vivid imagery seemed to me as I was growing up, it became apparent in my older years that this was a metaphor for life. Pop, in his own eccentric way, was suggesting that accomplishments are not made from wishing and hoping, but by actually working towards an outcome. I find this holds true in all aspects of life.

Pop, I ‘wish’ you could have made it through to see me finish this journey. I know you would be proud. I’m damn sure proud of your fighting spirit and fearless attitude towards cancer. I hope to emulate such strength throughout my life, and to foster it in all students I teach.

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Abstract

Recommended levels of physical activity provide a wide range of physiological and psychological health benefits for children, with martial arts training shown to have positive effects on several of these benefits. Schools, meanwhile, provide an ideal setting for the promotion of, and increased engagement in, physical activity among children. The primary objective of this thesis is to provide an evidence-based foundation for introducing martial arts training into Australian school settings.

This was approached through four distinct study aims: 1) review and evaluate the existing literature on the subject of school and community-based intervention programs with a martial art component that target school-aged children; 2) design, implement and evaluate a novel face-to-face intervention based upon the findings from aim 1; 3) design, implement and evaluate a subsequent homework program with similar outcomes to the face-to-face program; and, 4) identify the views and beliefs of current and pre-service teachers in NSW, Australia, regarding martial arts and the inclusion of such training in schools.

The four study aims were achieved through four separate studies: a systematic review; a pilot randomised controlled trial of the feasibility and efficacy of a school-based intervention (Kick-Smart) integrating mathematics skills and mental wellbeing into martial arts lessons; a six-week case study evaluating the implementation of the Kick-Smart program across several schools in the Hunter Valley region of NSW; and a cross-sectional questionnaire of 117 current and pre-service teachers in Australia exploring attitudes towards martial arts and their inclusion in the Australian school setting.

The findings from the four studies – each of which resulted in a peer-reviewed publication – indicate that integrating martial arts training and mathematical concepts is a viable option for achieving physiological benefits for students without sacrificing – and, indeed, even improving – academic outcomes. The feedback from the questionnaire also highlights that many teachers are willing to incorporate this form of education in their own classrooms and welcome martial arts training into the school setting.

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Glossary of Terms and Abbreviations

Term	Definition
Combatives	Combatives is the term for hand-to-hand combat training and techniques within the Australian, New Zealand, and American armies.
Martial arts	A term that encompasses the various forms/types/styles of combat sports and fighting practices (Cynarski & Skowron, 2014). This includes all self-defence techniques, and western combat sports e.g. boxing.
Wellbeing	One's state of fulfilment, emotions, resilience and belonging, which can be affected by life events and challenges (Campion & Nurse, 2007; Treptow, 2017)
Primary School	An educational setting for students in Kindergarten to Sixth Grade (also known as elementary school).
Physical Activity	Any bodily movement produced by skeletal muscles that requires energy expenditure (Caspersen et al., 1985).
Numeracy	Involves using mathematical ideas effectively to participate in daily life and make sense of the world. It incorporates the use of numerical, spatial, graphical, statistical and algebraic concepts and skills in a variety of contexts and involves the critical evaluation, interpretation, application and communication of mathematical information in a range of practical situations (NSW Government, 2007b)
Literacy	The ability to understand and evaluate meaning through reading, writing, listening and speaking, viewing and representing (NSW Government, 2007a)
Fitness	An ability to perform daily activities with vigour; a demonstration of traits and capacities that are associated with low risk of premature development of the hypokinetic diseases (i.e., those associated with physical inactivity) (Pate, 1988).

Abbreviations

MA	Martial arts
PDHPE	Personal Development, Health and Physical Education
PA	Physical Activity
MVPA	Moderate to Vigorous Physical Activity

Chapter 1. Overview

1.1. Contribution statement

The Kick-Smart program was a novel intervention designed, implemented and evaluated as a PhD study. The program was specifically developed to address both public health and educational outcomes. An outline of the contribution that I, Louis Burt, made to the Kick-Smart study is outlined below.

1.2. Program design and development

Under the guidance of my supervisors, I was responsible for the design and development of the entire Kick-Smart program, as well as the Kick-Smart Homework program. This included designing all program components, including the 12 face-to-face program sessions and the 18 homework sessions, student and staff resources, and presentations. All of these were implemented in single schools as pilot randomised control trials. Additionally, I was responsible for the design of the 'Kick-Smart Questionnaire' used in Study 4 to understand the views and beliefs of current and pre-service teachers in NSW, Australia, in conjunction and guidance of my supervisors. This involved developing questions, appropriate measures to be used such as five-point Likert scales, multiple choice questions and short answer questions, arranging them into logical sections and creating an online version of the questionnaire using the program 'Qualtrics.'

1.3. Ethics and safety approval

I was responsible for gaining ethics approval from the University of Newcastle (H-2019-0057), the NSW Department for Education and Communities (SERAP2020265) and for completing all related safety and child protection procedures relating to the implementation of both studies in the primary school setting. This included: developing a study proposal and justification, completing all ethics forms, developing information statements and consent forms for teachers, parents, children and school principals, developing assessment protocols and forms for all physical and educational assessments, developing the student and staff questionnaires and evaluation surveys, and ensuring all mandated child protection checks were completed for research staff.

1.4. Measurement of study outcomes, data collection and entry

In correspondence with my supervisors, appropriate outcome measures were decided upon for each of the four studies. During the face-to-face Kick-Smart study, and the subsequent Homework-based study, I was wholly responsible for training two volunteer research assistants in conducting the baseline tests, organising assessment sessions (including ordering and organising all equipment and scheduling sessions in the school) and supervising research assistants during all assessment sessions. During all studies, I was responsible for data entry and analysis, and for the safe handling of all confidential participant information.

1.5. Intervention delivery

I was responsible for delivering all program sessions (n=12) at the intervention school in the pilot study which included children (n=46) from a Grade 5 (mean age=10.95 ± 0.39 years; Female=23, Male=23) class in a school located in the Hunter Valley region of NSW, Australia. I also oversaw the delivery and adherence of the Kick-Smart Homework Study at school for this pilot study which included children (n=26) from Stage 2 (Grades 3 and 4) (mean age=8.86) in a school located in the Hunter Valley region of NSW Australia. Note that the school in which the homework study was run was a different school from the site in which the face-to-face program was run. The intervention delivery process included recruitment, organisation of tasks and development of all resources for the pilot study.

1.6. Analysis of data

In conjunction with my supervisors and other co-authors, the methods of statistical analysis were decided upon, and I completed all analyses using the computer software (SPSS Statistics 28), interpreted the results and presented the data in either text, table or figure formats.

1.7. Acquiring funding

No funding was acquired for any of the studies, or other content included in this thesis.

1.8. Presenting study results at conferences

I was responsible for presenting the findings of the Kick-Smart study (both oral and/or poster/abstract presentations) at several conferences such as *Staff and Students Talking About Research* (SSTAR) 2019 and 2021. In addition to these conferences, I was also responsible for applying for, and consequently having the study results accepted for a 'Poster Presentation' at the *International Society of Behavioral Nutrition and Physical Activity* (ISBNPA) conference in Auckland in 2020 – titled '*Kick-Smart: Promoting academic achievement, fitness and well-being in primary school-aged children. (Abstract Number: 925)*', however this was cancelled due to the CVI-19 pandemic. During my PhD candidature, I also embedded the teaching and learning of martial arts, based on this research, in EDUC2057 – a primary and secondary physical education teaching course at the University of Newcastle.

This thesis ties four academic research studies and subsequent research studies together to form a valuable contribution to an otherwise limited field of research. The first study - the systematic review – extends the literature review of the thesis and focuses on research of school-based martial arts programs. This forms the basis of Chapter 2. The review found a lack of high-quality research in this field and brought to the fore a need for such quality studies. This in turn provided the basis for the second research study, as discussed in Chapter 3. This pilot randomised feasibility trial of a school-based martial arts program, which is presented in

Chapter 4. Upon the successful completion of this study, a number of questions arose, one of which being 'Could a homework-based program of a similar nature be effective in providing positive results in areas similar to those of the previous, face-to-face study'. This led to the creation of the 'Kick-Smart Homework' study which is discussed in Chapter 5 and the study is presented in the third publication in this thesis. Throughout the delivery of the original Kick-Smart program, and the Homework program that followed, another research question arose – What are the views and beliefs of current and pre-service (currently studying an undergraduate degree in education) teachers regarding the inclusion of martial arts in school settings and martial arts in general? This research question created the foundations and the primary research question of the fourth and final research study which used cross-sectional questionnaire methodology and is presented in Chapter 6.

The combination of the four research studies and resulting publications provide the framework of this thesis provide an argument for the inclusion of martial arts in school settings throughout the state of New South Wales, Australia, and furthermore a step towards the inclusion of school-based martial arts studies Australia wide.

Chapter 2. Literature Review

This chapter presents a range of current issues and trends affecting children globally and nationally, including issues pertaining to educational, and health and wellbeing outcomes. Further, martial arts is presented as a physical activity with potential for addressing the issues prevalent in children in the school setting.

2.1. What are the current trends in mathematics performance?

Results from the Programme for International Student Assessment (PISA) – an international benchmark for assessment – indicate a decline in the number of high-performing Australian students in mathematics (Barnes, Gindidis & Phillipson, 2018). Another point of concern, outlined in the Trends in Mathematical and Science (TIMMS) data, is that 30% of Australian Year 4 students are achieving at or below the Low international benchmark, with 21% performing at the Low international benchmark while the other 9% did not reach this benchmark (Thomson et al., 2016).

2.2. What are the current trends in children's physical activity?

The international, and national guidelines recommend 60 minutes of moderate to vigorous physical activity (e.g., brisk walking or jogging) for children each day (Department of Health and Aged Care, 2021; Vetter et al., 2018; World Health Organization, 2020).

Australia's Physical Activity and Sedentary Behaviour Guidelines (Department of Health, 2017) for children are as follows:

- For health benefits, children aged 5–12 years should accumulate at least 60 minutes of moderate to vigorous intensity physical activity every day.
- Children's physical activity should include a variety of aerobic activities, including some vigorous intensity activity.

- On at least three days per week, children should engage in activities that strengthen muscle and bone.
- To achieve additional health benefits, children should engage in more activity – up to several hours per day.

However, despite these guidelines, and the many benefits of physical activity (such as increased cardiovascular health and reduced risk of obesity), 80% of youth worldwide are not reaching the recommended levels of physical activity (Aubert et al., 2018; Kennedy et al., 2019).

2.3. What are the benefits of physical activity?

Physical activity can be defined as bodily movement produced by skeletal muscles resulting in energy expenditure and has been linked to physiological and psychological benefits. Investigation into the links between physical activity and mental health issues remains a domain that requires greater documentation (Biddle et al., 2019). Over the past 13 years, there has been a substantial increase in research into physical activity and cognitive functioning, self-esteem and depression in young people (Biddle et al., 2019). Evidence for causal relationships between cognitive function, academic performance, anxiety, and depression has begun to emerge (Biddle et al., 2019; Hanrahan et al., 2019). Physiological health benefits of physical activity have been substantially researched, with strong associations between physical activity and cardiovascular health and disease dating back over half a century (Wahid et al., 2016). Research has shown that physical activity has a wide range of physical health benefits for children, such as improved bone health (Kathleen et al., 2014) and multiple reduced chronic disease risk factors, including waist circumference, VO2max, BMI z-score, conditional BMI z-score velocity and systolic blood pressure (Carson et al., 2014). Physical activity is also recommended in the current treatment guidelines for bronchiectasis (Joschtel et al., 2019) and has been associated with lower blood cholesterol, weight loss, increased bone density and increased muscular strength (Hanrahan et al., 2019), and may also be an independent protective factor against CVD (Kennedy et al., 2019).

2.4. What are the current trends in wellbeing?

Wellbeing is a multifaceted construct that includes an individual's physical, mental, emotional and social health. Wellbeing is strongly linked to happiness and life satisfaction, and can be described as how one feels about oneself and one's life (Department of Education and Communities, 2015; Tobia et al., 2019). Mental health issues have come to the fore of wellbeing in young people. Anxiety and other mental health issues represent one of the largest burdens of disease for adolescents globally (Gunnell, Kidger & Elvidge, 2018). According to the Australian Bureau of Statistics (ABS), in 2021 suicide was the leading cause of death of children 5–17 years (n=112), with a 13.13% increase from 2020 (Australian Bureau of Statistics, 2022). In 2021, the World Health Organization stated that depression, anxiety and behavioural disorders are some of the leading causes of disability and illness among young people, with mental health disorders representing 13% of the burden of disease in the 10- to 19-year-old age group (World Health Organization, 2021a).

2.5. What are the benefits of wellbeing in children?

The Wellbeing Framework for Schools (2015) outlines that enhanced wellbeing provides a context of positive emotions. In this positive context, learning may occur more effectively (Department of Education and Communities, 2015). Additionally, when children experience heightened wellbeing, they are more likely to feel connected to others in safe, trusting relationships and achieve better social, physical and emotional outcomes (Department of Education and Training, 2018; Rafferty et al., 2016). A positive state of wellbeing and enjoyment is strongly associated with increased satisfaction with life, greater confidence and self-efficacy, and broadened abilities to think in innovative, creative ways and problem-solve more effectively (Department of Education and Communities, 2015).

2.6 What are Fundamental Movement Skills and why are they relevant?

Fundamental Movement Skills (FMS) (run, hop, throw, squat, catch etc.) provide an understanding of the 'foundational qualities' that are the building blocks from which movement is developed and physical activity behaviours established (Hulteen et al., 2018). Children need to be taught foundational skills and provided with opportunities to practise them before levels of competency are achieved. It has been suggested that it takes 6–10 hours of practice to master each foundational skill, through which children gain confidence in their abilities, and an increased likelihood of developing healthy lifelong PA behaviours (Behan et al., 2022; Lubans et al., 2010). Although there were significant increases in all FMS among both primary school aged boys and girls in Australia between 2010 and 2015, prevalence of FMS competency remains generally low (Hardy et al., 2017). The positive association between FMS and participation in various sports and games have been outlined in various studies; however, the link between FMS and martial arts participation is yet to be fully explored. Recent research, however, shows that martial arts participation has potential to positively influence the development of children's motor skills (Li et al., 2022).

2.6. What is, or *are*, martial arts?

'Martial arts' is a collective term that encompasses a multitude of fighting and self-defence styles. Many martial arts share common ideas and geographical origins but, as time has passed, knowledge has been passed down, lost and/or adapted, and many sub-styles exist. For example, Karate is a household word, and many people understand that it is a style of fighting. However, it may be less well known that Karate has a mass of 'denominations', such as Chito-Ryu, Shotokan (Karate Alberta, N.D.) and Kaizen Ryu, which all present differently. With these differences in mind, it can nonetheless be said that all martial arts promote an active and healthy lifestyle, and most (particularly traditional) martial arts discourage, rather than encourage, violent incidents (Carlyle, 2010; Lu, 2008a; Navarrette, 2017).

2.7. What demands do martial arts make on the mind and body?

Depending on the martial art studied, the demands on the body and mind vary. An art such as Tai Chi (often called 'Tai Chi Chuan') combines slow, gentle movements with relaxation and deep breathing (Han et al., 2004), and therefore has a relatively small physical demand on the body and focuses on relaxing and calming the mind. The Israeli martial art of Krav Maga can be seen as being on the opposite end of the spectrum in many ways. This martial art has a primary focus on self-defence and often aims to simulate the stresses and uncertainty of real combat situations, teaching the students how to utilise dynamic and brutal techniques while under such stresses (Keren, 2014). Thus, the demands Krav Maga places on the mind and body are quite different to those of Tai Chi. Martial arts have existed around the world for over three thousand years (Lakes & Hoyt, 2004), but although martial arts have a long history, academic studies on the topic are limited. The scope of martial arts research is broad; however, existing studies primarily focus on the physiological and psychological effects of martial arts training, martial arts cultures, philosophies and histories, and the sociology of martial arts, as the following sections will explore further.

2.8. Research on martial arts and health

Within the limited number of high-quality research studies investigating martial arts and health, there has been a primary focus on psychological health outcomes including aggression levels, bullying behaviours and self-regulation associated with participation in martial arts in various populations (Abrahams, 2004; Lakes & Hoyt, 2004; Nosanchuk & MacNeil, 1989; Trulson, 1986; Zivin et al., 2001). Trulson (1986), who investigated the effect of martial arts training on a range of mental health outcomes in juvenile delinquents, defines juvenile delinquency as

> a period during development when the individual exhibits a lack of respect for the rights and property of others, the unwillingness to obey authority figures, and a strong desire to spend one's time according to his own dictates. (p.1132)

The three-armed randomised controlled trial conducted by Trulson (1986) included 34 high-school students and compared training in traditional Korean Taekwon-Do (three times a week for six months) and a modern version of Taekwon-Do (three times a week for six months) with a control group who received no training. The modern version of Taekwon-Do taught fighting skills and self-defence techniques, but did not emphasise the traditions or philosophy of the art. The study revealed that self-reported aggression and anxiety levels in the traditional Korean Taekwon-Do group dropped, and when their scores (post-training) from the Jackson Personality Inventory (JPI) were compared to the combined groups' scores from pre-training, average self-esteem, social adroitness and value orthodoxy had increased by, 8.18, 6.62 and 9.64 points respectively within a range of 20 points (Trulson, 1986). In contrast, participants in the modern version of Taekwon-Do conditions reported increased aggressiveness and anti-social behaviours, increased anxiety levels and risk taking, and decreased social adroitness and tolerance. The control group did not experience any significant change in any outcome measure. Importantly, reduced delinquency in the traditional Taekwon-Do group was sustained at a one-year follow up, while the participants from the modern Taekwon-Do group and the control group were still found to be delinquent as measured by the Minnesota Multiphasic Personality Inventory (Trulson, 1986).

The theoretical work of Parkes (2010) also explored the psychological impact of martial arts training on individuals. This study focused on the disciplinary aspects of martial arts. Parkes used martial arts training as a case study and argues that students 'subject' themselves to such discipline, knowingly or not, in an effort to achieve mastery of the art. In this way, martial arts contribute to the development of particular capacities in the individual, such as discipline or aesthetic quality of movement, that, arguably, depend on the art studied.

As an addition to the theme of (somewhat) willing personal 'subjection' to the discipline and culture of the martial arts, as argued by Parkes (2010), multiple studies have investigated the factors influencing an individual to commence training in martial arts. For example, Zaggelidis, Martinidis and Zaggelidis (2004) conducted a cross-sectional study with a sample of 107 individuals aged between 16 and 56, exploring the motives contributing to initial participation in Judo and Karate. They found that the most common reasons for initial engagement in martial arts were based around the 'interesting nature' of martial arts, in addition to 'physical-personal benefits' (such as self-defence). Similarly to the work of Kawamura, Kaise and Nibosi (1978), Zaggelidis et al. found that influences from friends and family were also common factors, along with participants viewing engagement in martial arts being a means of personal and physical cultivation (Kawamura et al., 1978; Zaggelidis et al., 2004).

Nosanchuk and MacNeil (1989) examined the effects of traditional and modern martial arts training on aggressiveness and propose a 'selection hypothesis', namely, that the personality of the individual also has an influence on one's decision to train in martial arts. Furthermore, they suggested that personality influences one's informed choice of which martial art to engage in. For example, an individual with a more aggressive personality may decide to train in a martial art that is more contact-focused, such as Muay Thai or boxing. The authors suggested that this 'selection hypothesis' may explain high dropout rates among novice students, assuming that the martial arts school is chosen at random. This is supported by Parkes (2010), who noted that his own selection of the first martial art school he ever attended, which eventually led to his life-long journey through various martial arts, was somewhat uninformed. Nosanchuk and MacNeil (1989) noted that many novice students leave due to their personal aggression levels exceeding the norms of the martial art school (*dojo*), and instead seek a martial art style that is more suited to their personality and needs. This is supported by Allen and Laborde (2014), who reported that not only participation but also sport performance is linked to personality traits.

2.8.1. Martial arts culture and history

Research has explored the various martial art cultures and histories to achieve a greater understanding of the social aspects of martial arts, rather than focusing only on the physical functions of martial arts (Donohua, 2005). Studies have focused on the cultural aspects of martial arts such as spirituality (Farrer, 2006), philosophy (Sasaki, 2008) and the notion of martial arts as a psycho-physical culture (Cynarski et al., 2015), while others have maintained a focus on the historical origins and development of various martial arts, such as the Filipino martial art Escrima (Somera, 1998), Pankration (Abrams, 1979; Arvanitis, 2003), Taekwon-Do (Pottle & Pottle, 2013; Stepan, 2002), Wing Chun Kung Fu (Braeley, 2012; Chu, Ritchie & Wu, 1998; Lee, 1972; Nerlich, N.D.; Smith, 1992), Ninjutsu (Adams, 1970; Hayes, 1981; Zoughari, 2013), Krav Maga (Keren, 2014), Aikido (Saito, 1975) and Jeet Kune Do (Lee, 1975). The literature outlines a common theme that supports martial arts as an avenue for self-development, with potential to impact an individual's wellbeing.

2.8.2. Pedagogical approaches to teaching martial arts

Pedagogy can be defined as the interactions between students, teachers and the learning tasks and learning environment (Murphy, 2008). There is extensive research exploring the most effective pedagogical approaches for use in school sport and physical education, and for developing physical literacy amongst children. Current evidence supports that a game-based approach to teaching and coaching is an effective pedagogical approach for use in youth team sports (Eather et al., 2021; Jones et al., 2023) and in the delivery of primary school physical education (Miller et al., 2015) when targeting improvements in FMS, game skills and a range of health and wellbeing outcomes.

Evidence-based frameworks such as the Supportive, Active, Autonomous, Fair, Enjoyable (SAAFE) principles, and the MASTER Framework (REF) have been developed to help teachers, coaches and practitioners plan, deliver and evaluate high quality physical activity sessions in school, sport and after-school settings (Lubans et al., 2017). Through high-quality planning and delivery, physical literacy of children can be promoted, especially when a mastery motivational climate is prioritised. Morgan et al (2019) have suggested that a motivation climate in physical education can be created by teachers when they adopt core elements according to TARGET acronym (task, authority, recognition, grouping, evaluation and time).

Despite the array of physical education and sport research pertaining to delivery methods, there seems to be little research relating directly to martial arts pedagogy in any context. It is interesting that such pedagogical rationales are often overlooked in this domain (Donohua, 2005) because, at a fundamental level, martial arts are organisational structures dedicated to the transmission of knowledge, skills and insights (Donohua, 2005). Levine (1990) notes that there is hope for educators who seek to create links between martial arts training and the liberal arts. He argues that this link can be bidirectional, highlighting benefits that martial arts pedagogy can present to liberal education and vice versa. For example, the hypothetical inclusion of the study of certain philosophical foci of martial arts into high school and university curricula presents possibilities for new dimensions of education and new roads for intellectual conceptualisation (Levine, 1990). The following section aims to outline the current research in the field of martial arts in school settings.

2.8.3. Martial arts in schools

Schools have been making significant, intentional contributions to the achievement of multiple outcomes in physical (Brammell, 1933), cognitive (Glaser, 1942), and psycho-motor domains in children for almost a century (St Leger & Young, 2009). The inclusion of martial arts in school areas such as the PDHPE curriculum and school sports programs has the potential to meet a range of important outcomes simultaneously. In this section of the literature review, I discuss the ways in which martial arts have been embedded into school settings.

Martial arts are typically included in the physical education curriculum subject, provided as an extra-curricular or school sport option (NSW Government, N.D.), or used in school-based intervention programs (typically targeting health-related outcomes) (Abrahams, 2004; Burt & Kent Butler, 2011). Many Eastern (Asian) schools – to which many popular martial art disciplines such as Kung Fu, Karate and Tae Kwon Do trace their origins – have long since adopted the study of a martial art, in one way or another, as a component of school curricula (Lu, 2008a). Before World War II, martial arts were taught in the Japanese education system (Sasaki, 2006); however, martial arts education was removed from schools following the War. After 1958, ‘Kakugi’ (combat sports) was the name given to the martial art taught in schools. In 2006, Japan experienced its first major education reform since 1947 via the *Fundamental Law of Education* (McNeill & Lebowitz, 2007), which made ‘Budo’ (translated as *martial arts*, or *martial way*) compulsory for students in Years 7 and 8 (Wert, N.D.). Kakugi was a Physical Education elective for boys in Japan, but in 2012, the reform introduced a terminology shift from Kakugi to Budo. In this subject, both male and female students have the option of choosing Judo, Kendo, or Sumo (Wert, N.D.). The shift in terminology was made in relation to the pedagogical and philosophical stances of the two terms, the aim being to move away from the combative and sport-like aspects of Kakugi, and toward spiritual growth and development, as implied by ‘do’ (translating to *way*) in the word Budo (Sasaki, 2008).

Instruction in martial arts is not confined to Asian schools. Martial arts are making their way into schools in post-industrial societies (e.g. Europe, Australia and America) in a variety of ways. After-school programs and ‘school-sport’ activities, school sporting clubs (Porter,

2008) and intervention programs that incorporate or focus solely on martial arts have emerged in these regions. For example, Winchester High in Massachusetts, USA, has introduced a 'Mixed Martial Arts club'. This club was suggested by one of the pupils, who had been a student of martial arts since he was eight years old (Porter, 2008). Similarly, Miller High School (USA) offered a month-long MMA-based physical education class in June 2009. Martial arts have slowly been making their way into schools over the past 20 years and can be taught in ways that minimise the risk of injury to participants: both Brian Carroll (Athletic Director of Winchester High) and Terry Richardson (Principal of Miller High School) reported to *Athletic Business* magazine that no one had been injured during their MMA sessions (Popke, 2009). Carrol also highlighted that not only was the MMA club teaching the student members discipline and improving their fitness, but

> [t]hey're really becoming tight as teammates. Some of these kids didn't have anything before this program. Now they're part of something. (Popke, 2009)

It is important to note that school-based programs such as the ones mentioned above are a relatively new phenomenon compared to other school sport programs such as rugby, which dates back to the 1800s (Portora Royal School, N.D.). A limited number of schools are becoming more accepting of martial arts training and the positive effects that it can have on students. The reasoning behind this will be explored in more depth later in this review.

Schools all around the world are slowly starting to recognise the effects that the instruction of martial arts has on students. Theeboom and De Knop (1998) noted that a large number of countries in Europe, including England, Germany, Ireland, Estonia and The Netherlands, are providing martial arts as organised sports in schools. Furthermore, many of these countries are showing an interest in introducing martial arts into physical education classes (Theeboom & De Knop, 1998). This study identified that of the countries incorporating martial arts into school, most indicated that their physical education curricula explicitly refer to martial arts (Theeboom & De Knop, 1998).

Additionally, martial arts are also emerging within subject areas other than physical education. An example can be found in a school in New South Wales, Australia. A teacher from St Philips Christian College in Port Stephens (Stephen Grant) has integrated the study of martial arts into his Japanese language teaching. It is noted that his Japanese language and martial art program has cross-curriculum links with PDHPE, Mathematics, Geography, History, Religion, Science and Art (Osborne, 2016). Grant stated that the incorporation of martial arts into Japanese classes attracts both sexes, but 'particularly engages boys in language learning' (Osborne, 2016). Grant also noted that the students who are less inclined towards sports, and those who are less academically motivated, find identities and are able to find a connection. These students are passing difficult exams as a result (Osborne, 2016). Saint Ignatius College – Riverview, another school in New South Wales, advertises that it too offers 'Martial arts / Tae kwon do' as both 'Summer' and 'Winter' sports (Saint Ignatius' College, N.D.). This example should be interpreted with some caution, however, as this report is anecdotal and does not provide scientific evidence to support the claims made.

As noted above, martial arts may also be introduced through school-based intervention programs. In 1994, a martial arts-based intervention program was conducted in a single elementary school in Brooklyn, New York. This program was based on martial arts and targeted at-risk students and their behaviour and learning in the classroom. The program involved a monitoring system whereby a student had to maintain an acceptable level of behaviour in their classroom in order to be able to attend the martial arts class (Glanz, 1994). One of the significant things about this program is that it worked with the school's curricular-instructional program. The involved students' class teacher provided and encouraged curriculum-based activities that drew from the students' martial arts class experiences, such as reading and writing based on martial arts topics (Glanz, 1994). Glanz (1994) noted that this intervention was successful in improving on-task behaviour, as well as overall behaviour (e.g. aggression) for many of the involved students; however, he suggests that martial arts as an intervention for 'at-risk' students requires further investigation and 'attention' (Glanz, 1994). Since this time, only a small number of studies have looked further into the idea of targeting at-risk students through martial arts-based interventions (see for example Abrahams, 2004).

Twemlow et al. (2008) focused on a traditional martial arts intervention called the *Gentle Warrior Program*. This program was implemented in three elementary schools in the USA. The sample consisted of 254 students from Grades 3, 4 and 5. Like many of its predecessors, this program aimed to reduce violence in schools. Similarly to the program detailed by Glanz (1994), the *Gentle Warrior Program* also included teachers, support staff, parents and volunteers, as well as the students participating in the program (Twemlow et al., 2008). Some of the activities in the program included students role-playing appropriate responses, rather than simply discussing them. Twemlow et al. (2008) argued that this physical, proactive approach encourages the students to apply problem-solving skills and actively decide on appropriate responses to aggression in a prosocial manner, rather than reciprocating aggression in day-to-day dilemmas. The program also emphasised the idea of being a *helpful bystander*, by coming to the aid of the victim rather than encouraging violent confrontations (Twemlow et al., 2008). Initially, the students were to participate in nine 45-minute sessions, then in the third year (maintenance phase) they were to participate in three 45-minute sessions. All sessions commenced with breathing and relaxation activities in order to heighten the students' control and awareness of their body. This was followed by stretching, then the practice of defensive techniques, role play of bullying scenarios and question-and-answer discussion based around philosophy with the martial arts instructor. The session concluded with a lesson recap and another relaxation exercise (Twemlow et al., 2008). In addition to having a relatively small sample of intervention sites, one of the major limitations of this study was the limited duration of the intervention, with the maximum attendance of a student being three training sessions; nonetheless, positive effects were noted. Another limitation was ‘the reliance on self-report of victimisation and helpful bystander behaviour’ (Twemlow et al., 2008). The authors suggested that social desirability may have influenced student responses. An interesting observation made by the authors is that overall aggression levels increased over time, irrespective of the degree of involvement in the program. They suggest that participation may not decrease aggressive behaviour over time, but may instead limit the trend of age-associated aggression increase characteristic of this developmental stage (Aber, Brown & Jones, 2003).

Gail Zivin et al. (2001) have also investigated the effects of a traditional martial arts intervention on a sample of middle school boys with bullying behaviours. There were promising results, with aggression levels decreasing for the treatment group, while there was no change for the control group. Additionally, the authors noted that the study

> demonstrated a martial arts program’s effectiveness in reducing violent behaviour and psychological characteristics that correlate with violence and delinquency. It also showed that it is feasible to involve school personnel in supporting a required martial arts course, taught by a martial arts master from the outside, on school property and coordinated with the school schedule. (Zivin et al., 2001, p. 453)

Increases in self-reported happiness and improved school work were also observed to be linked to participation in this program, while the four-month follow-up showed that the behavioural improvements made by the boys in the treatment group were retained (Zivin et al., 2001). It is also important to note that after the post-treatment data was collected, the control group was given the intervention and showed similar results (Twemlow et al., 2008). While these results seem promising, the work of Zivin et al. (2001) should be carefully interpreted due to the limiting factors of only using a single site for the intervention, and thus a relatively small sample size. Interestingly, Cuban (1989) reviewed a number of programs for at-risk students and found that there were correlations between the successful ones, concluding that success with at-risk children ultimately emerged from teachers and administrators working together (Cuban, 1989). Similarly, Zivin et al. (2001) noted that their program showed it is feasible to involve school personnel in supporting a required martial arts course. This may in turn indicate that martial arts programs in schools are likely to succeed, if correctly coordinated with the school as a whole. This aligns with the the principle of 'Relatedness' in Self-Determination Theory (SDT), by suggesting that success of a program is more likely if participants and the program itself are connected and supported by others (Deci & Ryan, 1985; Edmunds et al., 2006).

Another program of a similar nature was undertaken in an 'alternative' school in Pennsylvania for students who were in an emotional support program (Abrahams, 2004). The *InSpire Program* was implemented with the purpose of investigating the effects of a guidance-based martial arts program on the self-esteem, self-control and depression of at-risk elementary and middle school students (Abrahams, 2004). *Inspire* employed a traditional martial arts approach supported by 'classroom curriculum and family group meetings for students involved' (Abrahams, 2004, p. 198). Abrahams found that preliminary results of the *Inspire Program* included decreased key depression subscales and increased overall self-concept of the participating students, although the statistical analysis did not show significant changes. Qualitative reports, however, 'indicated positive differences in which students handled both in-school and out-of-school challenges' (Abrahams, 2004, p. 196). Abrahams (2004) concluded by emphasising the need for further studies of this nature in both alternative schools and mainstream schools.

The above outlines the major school-based martial arts studies in the literature, implemented in School Sport and as a PDHPE subject. I have also shown that although there are *some* teachers and schools using martial arts in other key learning areas (e.g. Stephen Grant of St Philips Christian College), there is a lack of research based on martial arts intervention programs in schools and a need for further investigation into this topic.

2.9. Objections to martial arts in schools

Two common concerns for the delivery of martial arts programs in school are the potential for increased rates of violent incidents (Lu, 2008a) and risk of injury. These concerns are reasonable, particularly from the perspective of persons who do not have a deep understanding of martial arts, or at least the philosophies behind them. The next section of this review will address both of the points mentioned above.

2.9.1. Including martial arts activities in schools could lead to violent incidents

It is known that martial arts promotes an active and healthy lifestyle, and most (particularly traditional) martial arts discourage rather than encourage violent incidents (Carlyle, 2010; Lu, 2008a; Navarrette, 2017). In 2000, the question 'Should martial arts be taught in physical education classes' was raised in *The Journal of Physical Education, Recreation, and Dance*. There were concerns raised about both the potential violence and discipline issues, as well as counter-views arguing that martial arts and violence are not commonly found to affect each other (Lu, 2008b).

One of the main barriers to people taking up martial arts as a hobby, or welcoming martial arts into the school environment, is misconceptions about traditional martial arts (Angleman et al., 2009; Chan, 2000; Cox, 1993; Lu, 2008b; Martin, 2006; Woodward, 2009). Traditional martial arts training is often misinterpreted and associated with the fighting skills and violence that are glorified and propagated in movies, television shows and other popular culture (Lu, 2008b). The 'martial artist' stereotypes depicted in these films find themselves in a number of situations in which they must defeat an opponent (or a whole room full of opponents) using acrobatics, choreographed kick combinations and weapons. The kicking and screaming Bruce Lee is often mentioned as an example of the martial arts stereotype. This seemingly works in two ways. The first is that the fighting skills he displays highlight the violence that people associate with martial arts, which leads to the misrepresentation that is being discussed. The second stereotype that Lee's signature screams and sounds, along with his small stature and regular targeting of his larger opponent's groin seem to undercut his legitimacy as a tough, heterosexual warrior (Chan, 2000) and instead project an image of the martial artist as a 'dirty' fighter – someone who fights using unfair or frowned-upon techniques. These stereotypes are counterproductive in terms of getting martial arts accepted into schools, as they highlight a largely inaccurate emphasis on violence and display a lack of normative hetero-masculinity (Chan, 2000) by the male practitioner.

When taking into account the notion of martial arts promoting violence, it is also important to consider the promotion of violence and antisocial behaviours through other sports. Sheard and Dunning (2013) stated that rugby is undoubtedly one of the roughest modern sports, due to its rules legitimising a high level of violent physical contact. Egge (2008) suggested that although sport itself is infrequently the sole basis of violence, it can be a catalyst and an accelerant, converting feelings of hatred and dislike into aggressive and/or violent actions (Egge, 2008). It is suggested this could be linked to the sociology of team sports, as noted by Beauchamp and Eys (2014) who found that those involved in team sports reported significantly more anger and aggression than their counterparts who played individual sports. In addition, it has been found that at a summer camp where the subjects were placed into teams, antisocial behaviour such as rude, disparaging comments and physical aggression began to emerge toward those not in the aggressor's team (Sherif et al., 2010). Rugby is widely accepted in primary and secondary schools in Australia, with many schools having representative teams, yet one could argue that team sports such as rugby are also likely to promote violence and/or antisocial behaviour. This furthers the argument that martial arts is indeed misunderstood and misrepresented as a largely violent activity. If these misrepresentations of martial arts and its practitioners are shown to be inaccurate, it may lead to greater acceptance of martial arts not only in schools but also more generally.

Many studies have investigated the risk factors that contribute to youth involvement in violent behaviours (see e.g. Esbensen et al., 2009; Herrenkohl et al., 2000; Peterson et al., 2007). There are a variety of contributing factors and several commonly occurring predictors/factors that correlate with youth violence. One aspect that is consistently recognised as one of the strongest predictors of youth delinquency is the role of peers (Esbensen et al., 2009). Peer-related factors include association with antisocial or delinquent peers, as well as limited relationships with prosocial peers (Esbensen et al., 2009). Emotional and social distancing and isolation have also been found to be significant factors that lead to externalising behaviours (Esbensen et al., 2009), particularly for violent female youths (Blum, Ireland & Blum, 2003). Family-related factors such as poor parental management (e.g. lack of supervision and moral guidance, inconsistent and/or harsh discipline, permissiveness) have been argued by some researchers to be catalysts for involvement in youth violence (Esbensen et al., 2009; Herrenkohl et al., 2000). Additionally, young people with weak connections to parental figures are argued to engage in antisocial behaviours due to a lack of integral, indirect control of their behaviour. The level of parental monitoring (according to self-control theory) (Esbensen et al., 2009) of a children's behaviour (e.g. activities and whereabouts) plays an important role in the development of self-control, with low levels of monitoring likely to lead to low levels of self-control for the youth (Gottfredson & Hirschi, 1990). It should be noted that involvement in martial arts training is not mentioned anywhere in these works as a major contributing factor to involvement in violence among youths.

Similarly, a public topic of debate has been whether or not the playing of violent video games is connected with violent behaviour in real-life (FoxFriendsFirst, 2018). Much research has been conducted, and yet there is still debate among scholars whether this is true or not. For example, Markey, Markey and French (2015) suggested that studies often find links between violent video games and minor aggressive behaviours such as exposing the 'victim' to an unpleasant noise. However, in relation to violent assault and homicide their findings are similar to those of DeCamp and Ferguson (2017), who suggested video games have little to no role in youth violence. In the Fox News segment 'Violent video games increase aggression, desensitize kids?' (FoxFriendsFirst, 2018), it was highlighted that under-age children want to play 'Mature' rated games (17 years +), and are being subjected to high levels of violence in such games. Based on the risk factors from the previous paragraph, this could be argued as a parental control issue, rather than an issue caused by the video games (and the creators) themselves. Similarly, it could be argued that the violence that some associate with martial arts practice may be more related to the risk factors mentioned above, rather than the training itself. Considering this, there is a lack of literature that looks at violent incidents in schools comparing students who are enrolled in martial arts classes with students who are not, or who play other sports. This may be an interesting area for further investigation.

2.9.2. Martial arts training is dangerous and could lead to injury or death

The second common argument against martial arts in schools concerns the participants' wellbeing during the activity rather than the perceived subsequent repercussions. Anecdotally, I have found that many schools are concerned about the risk of injury they associate with martial arts training. This may again be attributed to the perceptions of martial arts created by media and films such as Bruce Lee movies, the Ultimate Fighting Championship (UFC), and *Matrix*-like moves that many associate with martial arts training. Many school administrators may not be aware of prior school-based martial arts programs (Abrahams, 2004; Glanz, 1994) and the research that supports them. They may be daunted by the perceived liability of including a martial arts program at the school (Abrahams, 2004). However, research suggests that compared to other popular sports, martial arts training is quite low on the list of injury risks (Australian Institute of Health and Welfare, 2017).

In the Australian Institute of Health and Welfare (AIHW) report *Hospital care for Australian sports injury 2012–13*, multiple martial arts (Aikido, Chi Kung, Judo, Jiu-jitsu, Karate, Kendo, kick-boxing, Ninjitsu, Taekwon-Do, Tai Chi, and martial arts [other]) were grouped together into the single category 'Combative Sports' (AIHW, 2017). Combative sports were ranked 10 (the lowest) for sports associated with hospitalisation for sport-related facial fractures. The number one ranking sport was rugby, followed by Australian Rules football, football (other and unspecified), soccer and cycling (AIHW, 2017). Combative sports also ranked lowest for hospitalisation for sport-related shoulder dislocation and for sport-related injury to the spine (AIHW, 2017). In the other injury categories, including sport-related cruciate ligament injury and sport-related head injury, combative sports did not even rank in the top ten (AIHW, 2017). Additionally, in a study of major trauma cases and deaths in the state of Victoria, Australia, over a 10-year period, cycling, motor sports and equestrian activities were the most common cause (Ekegren et al., 2018), with neither Combative Sports nor Martial Arts receiving a mention. These results should be interpreted with caution, as they may be influenced by the popularity of each sport, and may not be a true indication of which sport has the greatest risk of incident.

Interestingly, when martial arts are compared to sports such as netball, soccer and basketball, which are all commonly played in Australian schools, each of these sports rank as more dangerous than martial arts or combative sports.

2.10. Summary

This literature review has highlighted the many health benefits of martial arts and summarised the findings of existing martial arts research studies targeting young people in the school setting. This review also discusses the issue of misconceptions and concerns about incorporating martial arts into schools. It is evident that further investigations of martial arts are required to build the evidence base for its effectiveness in improving health outcomes in children (through high-quality studies) and for its feasibility for use in school-based PDHPE and sporting contexts. There is a need for more intervention programs that use martial arts as the catalyst for learning and change. Additionally, the programs that do exist do not incorporate modern martial arts, gymnastics or acrobatics elements. It is to a systematic review of previous school-based martial arts programs that this literature review now turns, with the inclusion of the first research paper: Burt, L. D., Riley, N., & Eather, N. (Submitted 12 August 2022). Martial arts-based intervention programs targeting physiological, psychological, and cognitive outcomes of children and adolescents in school and community settings: A systematic review. *Asia Pacific Journal of Education* (Under review).

Chapter 3. Study 1 – Martial Arts Based Intervention Programs Targeting Cognitive, Psychological and Physiological Outcomes in School Settings: A Systematic Review

3.1. Introduction to paper

The previous chapter discussed the literature, highlighted the many health benefits of martial arts and summarised the findings of the existing (albeit limited) martial arts research studies targeting young people in the school setting. The literature review also identified and answered misconceptions and concerns about incorporating martial arts into schools. There is a need for more intervention programs that use martial arts as the catalyst for learning and change in schools. Additionally, such programs as do exist lack modern martial arts, gymnastics or acrobatics elements. This gap provides the opportunity to systematically investigate current literature surrounding school interventions targeting cognitive, psychological and physiological outcomes. The following publication presents the findings of this systematic review.

Burt, L. D., Riley, N., & Eather, N. (Submitted 12 August 2022). Martial arts-based intervention programs targeting physiological, psychological, and cognitive outcomes of children and adolescents in school and community settings: a systematic review. *Asia Pacific Journal of Education* (Under review).

3.2. Statement of contribution of others

By signing below I confirm that Mr Louis Burt contributed substantially in terms of study concept and design, data collection and analysis, and preparation of the paper/publication entitled *Martial arts-based intervention programs targeting physiological, psychological, and* *cognitive outcomes of children and adolescents in school and community settings: a systematic review*.

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3.3. Martial arts-based intervention programs targeting physiological, psychological, and cognitive outcomes of children and adolescents in school and community settings: a systematic review

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Abstract

This systematic review aimed to identify and evaluate the effectiveness of school and community-based interventions that utilised martial arts training for improving cognitive, psychological, and physiological outcomes in children and adolescents. A structured electronic search was conducted using MEDLINE, SPORTDiscus and SCOPUS databases. From a total of 349 studies meeting the search criteria, 46 studies were deemed eligible after title and abstract and full text review, were assessed for risk of bias and data extracted for analysis. The available data suggests that martial arts-based interventions can have a positive effect on physiological and psychological outcomes, as well as cognitive outcomes in children and adolescents when delivered in school and community settings. However, high risk of bias and heterogeneity in study outcomes and study methodology limit the evidence for impact or causality. Further studies are needed to build evidence for feasibility and utility of school- and community-based martial arts training for improving varied outcomes in children and adolescents.

Key words: physical activity, child, mental wellbeing, academic performance

Introduction

Wellbeing is a multifaceted construct that includes an individual's physical, mental, emotional and social health (Pressman, Kraft & Bowlin, 2013). Wellbeing is strongly linked to happiness and life satisfaction, as well as personal and professional success, productivity, more effective learning and increased creativity (Department of Education and Communities, 2015; Ruggeri et al., 2020). Evidence for the extensive physiological, psychological and cognitive health benefits of physical activity for children and adolescents is well-publicised – yet 80% of children and adolescents worldwide do not undertake the minimum amount of physical activity required to achieve health benefits (Guthold et al., 2020; Hallal et al., 2012). International physical activity guidelines recommend that children and adolescents should engage in at least 60 minutes of moderate to vigorous daily physical activity (Vetter et al., 2018). Furthermore, regular vigorous and muscle/bone strengthening activities are recommended (World Health Organization, 2020). Inadequate levels of physical activity have been linked to numerous preventable health issues, e.g., obesity, hypertension, metabolic disease (Joschtel et al., 2019; Vetter et al., 2018), and a range of mental health problems such as anxiety and depression in children and adolescents (Biddle et al., 2019; Hanrahan et al., 2019; Lubans et al., 2016).

Research investigating links between physical activity and mental health issues dominate the literature, and their findings confirm that improved mental health status in children and adolescents can be achieved through participation in physical activity, especially sport (Eime et al., 2013). However, evidence for participation in specific types of physical activity (such as specific types of recreation activities, team or individual sports) and physical and mental health status across the lifespan is limited (Biddle et al., 2019). Over the past decade, evidence for a causal relationship between physical activity and cognitive function and academic performance has grown, with children and adolescents who are regularly physically activity and/or achieve the highest levels of physical fitness reaping the greatest benefits (Biddle et al., 2019; Hanrahan et al., 2019). These links are important, as the mental health of young people is in decline in many countries. For example, prior to the COVID-19 pandemic mental disorders were the leading cause of the global health burden, with anxiety and depression being the greatest contributors in this area (Santomauro et al., 2021). Since the beginning of the pandemic there has been a significant increase in major depressive disorder globally, with women being affected more than men and younger age groups experiencing more significant negative effects than older groups (Santomauro et al., 2021). Furthermore, the academic performance of children in a number of countries has not improved over 20 years. According to the Trends In International Mathematics and Science Study (TIMSS), the performances of Hungary, Norway and Sweden declined in 8th grade science between 1995 and 2015. Results from the OECD Programme for International Student Assessment (PISA) 2018 indicate that the mean performance in reading in countries including Korea, the Netherlands, Thailand, Australia and New Zealand has been declining between 2000 and 2018 (Schleicher, 2019). Exploring new ways to facilitate improved physical, mental and cognitive health among children and adolescents is thus warranted.

'Martial arts' (MA) is a collective term that encompasses the multitude of physical activities involving fighting and self-defence systems which have been developed and implemented around the world (Rousseau, 2019). It is estimated that 70 million people currently practise Taekwon-Do worldwide and approximately 100 million are involved in competition-based Karate (Ko & Kim, 2010; Origua Rios et al., 2018; World Karate Federation, 2014). In the United States of America, the number of participants six years of age and older in martial arts was approximately 3.42 million – approximately 1.05% of the population – in 2017 (Lock, 2020). The United States leads the way in participation globally, with 16 times more martial arts schools than Australia, which comes second for the global industry (Gaille, 2018). MA participation ranks in the top 20 sports and physical activities for children and adults in Australia, with 316,826 participants annually – approximately 1.25% of the Australian population in 2019. Participation in MA also increased in England and the United States between 2015 and 2019 (Industry Research Reports United States, 2021; Lange, 2021). High participation rates across the lifespan provide impetus for a systematic review of the available literature to synthesise reported physiological, psychological, and cognitive health benefits (Abrams, 1979; Cicović et al., 2011; Lakes & Hoyt, 2004).

Mental health is at the forefront of wellbeing in young people, with mental health issues (such as anxiety and depression) representing one of the largest burdens of disease for adolescents globally (Gunnell, Kidger & Elvidge, 2018). According to the World Health Organization, suicide is the fourth leading cause of death of children between 15 and 19 years of age (World Health Organization, 2021b). An estimated 14% of children and adolescents worldwide experience a mental disorder (Polanczyk et al., 2015). In relation to education, mental illness in young people can lead to higher drop-out rates and poor academic performance (NSW Mental Health Commission, 2014). In contrast, enhanced wellbeing provides a context of positive emotions. Additionally, when children experience heightened wellbeing, they are more likely to feel connected to others in safe, trusting relationships and achieve better social, physical and emotional outcomes (Department of Education and Training, 2018; Rafferty et al., 2016). A positive state of wellbeing and enjoyment can lead to greater self-efficacy and broadened abilities to think in innovative, creative ways and problem solve more effectively (Ruggeri et al., 2020). Thus, wellbeing is an enabling condition for positive learning outcomes (Morinaj & Hascher, 2022)

Given the current declining trends in various facets of physical activity, mental health and academic achievement among children and adolescents worldwide, researchers consistently seek innovative ways to engage young people in programs that target these areas (either individually or collectively). The physical nature of MA training lends itself to the improvement of a wide variety of physiological outcomes (Bu et al., 2010), and potentially increased mental and cognitive health. For example, the work of Byun et al. (2014) and Cicović et al. (2011) indicates that participation in MA can have a positive effect on the posture of children and adolescents, as well as significantly improving their motor and functional abilities. The theoretical work of Parkes (2010) explores the psychological impact of MA training (Parkes, 2010). Parkes highlights that students 'subject' themselves to discipline, knowingly or not, to achieve mastery of the art. In this way, MA contributes to the development of resilience and other capacities (e.g., strength, or aesthetic quality) in the individual. This is supported by Trulson (1986), whose 3-armed trial found that traditional MA training can have a positive effect on a range of mental health outcomes in juvenile delinquents. MA training also demonstrates capacity to contribute to an individual's cognitive development. At a foundational level, each martial art is an organisational structure, dedicated to the transmission of knowledge, skills and insights regarding fighting and self-defence (Donohua, 2005). The MA learning cycle can be seen to resemble Kolb's Experiential Learning Cycle (Wallace & Becker, 2018). This involves students being introduced to knowledge through concrete experiences, such as a demonstration of a technique or tactic, which the students then engage with through guided practice. As the learner's competence increases, so too do the boundaries given to them by their teacher, allowing the students to experiment and participate in reflexive observation and abstract conceptualisation of these techniques (Wallace & Becker, 2018). Finally, the students are given opportunities to engage in the practical application of the skills they are learning, often in the form of sparring (Øvretveit, 2018; Wallace & Becker, 2018) or competition fighting. This structure of knowledge and skill transmission makes MA training a potential platform for cognitive development learning.

School- and community-based MA programs show potential for making positive changes across these important outcomes in young people (Lakes et al., 2013); however, a systematic review of the impact of MA interventions in these settings has yet to be conducted. This review systematically summarises the findings of MA studies targeting children and adolescents for improving physiological, psychological and academic outcomes. The findings of this review may serve to inform future research, policy and practice relevant to education professionals and MA professionals looking to contribute to improvements across these outcomes.

Methods

Search strategy

A structured electronic search of all publication years (through April 2022) using MEDLINE Complete, SPORTDiscus with Full Text, and SCOPUS, was conducted. The following search terms were used: 1. Child*, student*, youth*, adolesc*, teen*, young*, school*; 2) elementary, middle, primary, high, secondary, after, junior or senior school*, community, 3) intervention, pilot, trial, RCT, study, strategy, experiment, quasi-experimental, 4) and Self-defen*, martial art*, martial-art*, Karate*, Taekwon*,Tae-kwon*, Kung-fu, MMA, mixed martial arts, Jiu-Jitsu, boxing. The studies were limited to peer-reviewed publications written in English. Next, all duplicates were removed and titles and abstracts of identified articles were assessed for suitability. Following this, full-text articles were retrieved and assessed for inclusion.

Study Selection Criteria

Studies were considered eligible if they: (1) included a MA training component (2); examined children and/or adolescents (4–18 years old); (3) physiological outcomes, and/or (4) examined cognition outcomes, and/or (5) examined academic performance outcomes, and/or (6) examined wellbeing outcomes, and/or (7) involved an intervention of ≥4 weeks in duration, and/or (8) included a control comparison group.

Data Extraction

Key study characteristics were extracted from each study by the first author and checked by author two. All characteristics are presented in Table 3.3.

Risk of Bias

Risk of bias was assessed by two independent academics on the research team, to ensure validity. Scoring discrepancies were discussed and a consensus formed. Risk of bias for the 46 studies was assessed using a checklist adapted from the PRISMA statement, scoring each criteria out of 3, with the final risk of bias score being a sum of all sections (5 being the lowest and 25 being the highest scores possible) as shown in Table 3.2.

Results

Study Characteristics

Martial art basis

Of the 46 papers included in this review, 11 MA styles were identified, with Taekwon-Do being the most reported (n=12 studies). Furthermore, key styles identified varied within martial elements, with striking-based arts (such as Karate, Taekwon-Do, boxing and Capoeira) dominating (n=26 studies). Full details regarding style of MA are presented in Table 3.3.

Program delivery

The structure, content and delivery of the programs included in the study also varied considerably. Twelve studies included a theoretical component, eight included the practice of *kata* (also known as forms, patterns or *poomsae*) and seven studies used a combination of MA practice and other fitness-related activities (e.g., ball games, or resistance training). Meditation and/or relaxation activities were also incorporated in eight studies. The majority (n=38) of studies were delivered face-to-face or included a face-to-face component. Two studies incorporated face-to-face and indirect delivery modes (online) (Garcia et al., 2021; Taylor et al., 2006), and the remaining six studies did not outline their delivery modes (Altavilla et al., 2019; Chau, 2021; Kim et al., 2013; Shin, Jung & Kang, 2011; Simonović et al., 2011; Tyshchenko et al., 2018). The majority (n=26) were taught by MA instructors/coaches. Thirteen did not disclose who taught the content (Altavilla et al., 2019; Byun et al., 2014; Chau, 2021; Cho, So & Roh, 2017; Cicović et al., 2011; Kim et al., 2013; Lee & Kim, 2015; Mroczkowski, 2013; Mujanović, Kahrović & Vidaković, 2012; Shin et al., 2011; Simonović et al., 2011; Tyshchenko et al., 2018; Yogi & Kyan, 2021), four were taught by a non-descript 'instructor' (Baiocchi et al., 2017; Decker et al., 2018; Sinclair et al., 2013; Taylor et al., 2006), two interventions were delivered by a school teacher (DelCastillo-Andrés, Toronjo-Hornillo & Toronjo-Urquiza, 2019; Nauta et al., 2013), one was taught by a registered psychologist and a martial arts instructor (Moore, Woodcock & Dudley, 2021) and one was taught by a qualified school teacher who was also a martial arts instructor (Reference 1).

Setting

Most of the studies were school-based (n=33), nine were community-based and four did not specify the setting (Cho et al., 2017; Lee & Kim, 2015; Roh et al., 2018; Trulson, 1986). While the was was notable diversity across assessment measures, the majority of both community-based and school-based studies included a physiological measure; however, a larger percentage difference between the two (55% and 73% respectively) was seen. Most studies from both setting that assessed a physiological measure reported positive results in favour of the MA group. There was only a small percentage difference between the numbers of community-based and school-based (33% and 39% respectively) studies that included a psychological assessment. Most studies from all settings reported positive results in favour of MA group. A small, similar percentage (22% and 27% respectively) of both community and school-based studies included a cognitive assessment. All of these assessments resulted in scores in favour of the MA group. The following table compares dose, duration and frequency based on setting. Table 3.1

Table 3.1. Comparson of study findings by setting

	Community-based studies	School-based studies	Total average
Average dose (length of session [minutes]	55	63.75	61.84
Average duration (weeks)	8.83	18.77	17.14
Average frequency (sessions per week)	2.17	1.93	2.11

As shown in Table 3.1, the only significant difference was duration, which was significantly lower in community-based interventions, with intervention duration being less than half of the total average of all studies.

Sample characteristics

Many studies provided limited detail of their sample characteristics. For example, specific age of participants was not stated in many papers, or where multiple age brackets were provided the number of participants of each age was not provided. Additionally, ethnicity, sex and socioeconomic status of participants were rarely stated. Sample characteristics were often presented in varied ways (including age, grade, school years), which made study comparisons difficult. Studies varied in how age of the participants was presented, and many provided limited detail regarding age at the time of the study, so these participant ages were split into two groups: 'Age Group' (in years of life) and 'Grade' (in school years: Kindergarten, Year 1, Year 2, etc.). Nineteen studies included participants between five and 12 years old, and 20 included participants aged between 13 and 18 years old. Fourteen studies included participants in school grades between Kindergarten and Grade 6, and seven included participants in grades between 7 and 12. Eleven of the studies focused on a single age/grade. The mean age/grade range of all the studies that provided this information was 4.57 years.

Table 3.2. Risk of bias

Reference	1. Study design	2. Random selection	3. Sample description	4. Measure valid	5. Confounders adjusted	Overall risk of bias score
Abrahams (2004) Year: NR Country: USA	1	1	1	1	1	5
Altavilla et al. (2019) Year: NR Country: Italy	3	2	3	2	1	11
Baiocchi et al. (2017) Year: 2013-2014 Country: Kenya	3	3	2	1	2	11
Burt et al. (2021) Year: 2019 Country: Australia	3	2	2	3	2	12
Byun et al. (2014) Year: 2013 Country: South Korea	3	3	2	2	1	11
Chau (2021) Year: NR Country: Vietnam	2	1	1	1	1	6
Cho, So & Roh (2017) Year: NR Country: Korea	3	3	2	3	1	12
Cicovic et al. (2011) Year: NR Country: Bosnia	3	1	1	3	1	9
Cipra and Hall (2019) Year: NR Country: USA	3	2	3	1	1	10
Decker et al. (2018) Year: 2015 Country: Malawi	3	3	2	1	2	11
Decker et al. (2018) Year: 2017 Country: Malawi	3	2	3	2	2	12

Reference	1. Study design	2. Random selection	3. Sample description	4. Measure valid	5. Confounders adjusted	Overall risk of bias score
DelCastillo et al. (2019) Year: 2018 Country: Spain	3	2	3	1	3	12
Ebesugawa et al. (2010) Year: 2009 Country: USA	3	1	1	1	1	7
Edelman (1994) Year: 1994 Country: USA	2	1	1	2	1	7
Fung & Lee (2018) Year: 2013 Country: Hong Kong	3	2	2	3	3	13
Garcia et al. (2021) Year: NR Country: USA	1	1	3	2	3	10
Glanz (1994) Year: NR Country: USA	2	1	2	1	1	7
Greco et al. (2019) Year: 2019 Country: Italy	3	3	3	3	3	15
Greco et al. (2020) Year: 2019 Country: Italy	3	2	3	3	3	14
Harwood et al. (2021) Year: NR Country: Israel	3	1	3	3	2	12
Hemphill et al. (2019) Year: NR Country: New Zealand	2	1	1	1	1	6
Kim et al. (2013) Year: NR Country: Korea	3	1	1	3	1	9
Lakes et al. (2004) Year: 2000-2001 Country: USA	3	3	3	2	2	13

Reference	1. Study design	2. Random selection	3. Sample description	4. Measure valid	5. Confounders adjusted	Overall risk of bias score
Lakes et al. (2013) Year: 2012 Country: USA	3	2	1	2	1	9
Lee & Kim (2015) Year: NR Country: Korea	3	1	2	3	1	10
Ludyga et al. (2021) Year: NR Country: Switzerland	3	2	3	3	3	14
Ma et al. (2018) Year: 2016 Country: Hong Kong	3	2	3	3	3	14
Marusak et al. (2020) Year: NR Country: USA	2	1	3	3	3	12
Moore et al. (2021) Year: NR Country: Australia	3	3	3	3	2	14
Mroczkowski (2013) Year: NR Country: Poland	3	1	2	3	1	10
Mujanovic et al. (2012) Year: NR Country: Serbia	3	1	2	3	1	10
Nauta et al. (2013) Year: 2009 Country: Netherlands	3	2	3	1	2	11
Ng-Knight et al. (2022) Year: NR Country: England	3	2	3	2	2	12
Nogueira et al. (2014) Year: 2014 Country: Australia	3	2	2	3	1	11
Roh et al. (2018) Year: NR Country: Korea	3	2	3	3	2	13

Reference	1. Study design	2. Random selection	3. Sample description	4. Measure valid	5. Confounders adjusted	Overall risk of bias score
Rourke (2017) Year: 2017 Country: Australia	2	1	1	1	1	6
Shin (2011) Year: 2011 Country: Korea	1	1	2	3	1	8
Simonovic (2011) Year: NR Country: Serbia	1	1	2	2	1	7
Sinclair (2013) Year: NR Country: Kenya	3	1	2	1	1	8
Song (2004) Year: 2004 Country: Korea	3	1	1	2	1	8
Taylor (2006) Year: 2003 Country: New Zealand	3	1	2	3	3	12
Trulson (1986) Year: NR Country: USA	3	1	2	1	1	8
Tyshchenko et al. (2018) Year: 2017 Country: Ukraine	3	1	2	2	1	9
Van Rheenen (2011) Year: NR Country: USA	2	1	1	1	1	6
Yukimoto & Kyan (2021) Year: 2018 Country: Japan	2	1	1	2	1	7
Zivin et al. (2001) Year: 2001 Country: USA	3	1	3	2	1	10

Additional detail	Study quality coding		
	STRONG 3	MODERATE 2	WEAK 1
Experimental and prospective observational studies have greater capacity to make causal inferences. Cross-sectional study cannot do so and would be coded as high risk of bias	Experimental	Longitudinal / Prospective observational	Cross-sectional
Internal validity, likelihood of selection bias from non-random sampling. Was convenience sampling used?	Stratified random sampling of study sites and/or participants based on population weightings for age, sex, or SES. For experimental studies	Some attempt at random selection of sites and/or participants, but selection methods not based on population distribution of key demographic variables	Non-random selection of sites or participants (i.e., convenience sampling used)
Details provided re. sample: age (mean±SD), sex (N and % male/female), socio-economic status (postal code-based index, parental education/income etc), and racial/cultural background	All characteristics present and clearly described	Some characteristics (i.e.,2-3) present and clearly described	Few characteristics (i.e., 0-1) present and/or description is unclear/incomplete
Lab or field-based measures are valid. E.g., criterion measures such as 1-5 RM leg press/bench press, or for field-based measures as per expert recommendations (i.e., U.S IoM advice = handgrip strength, standing long jump)	All measures are objective and referenced	Includes at least one obective measure and other measures may be field measures, not referenced or validity/reliability not recorded	Other field-based measures with questionable validity used, or subjective measures.
Analysis adjusts (where relevant) for age (if sample age range is large), sex (if males and females are included in study), a measure of SES (e.g., parental income/education, area-level index of deprivation), and cardio-respiratory fitness. For longitudinal and experimental studies, analysis adjusts for baseline values of IV and DV.	All relevant confounders included in analysis	Some relevant confounders (i.e., 2-3) included in analysis	Few or no (i.e., 0-1) relevent confounders included in analysis
Criteria were added to create an overall risk of bias score: low risk of bias studies (15–11), moderate risk of bias (10–6) and high risk of bias (5–0).			

Table 3.3. Study characteristics

	Reference; Year; Country	Study Design	Setting	Intervention dose	Sample size	Sample Characteristics	Age / Grade	Age / Year Range	Martial Art (S/ G/ M)
•	Abrahams (2004) Year: NR Country: USA	Feasibility study	"Alternative school"	A: NR B: 1 C: 40	NR	At risk students who engage in violence and who have been the subject of bullying	Grades 4-12	8	Generic Self-defence (N/A)
•	Altavilla et al. (2019) Year: NR Country: Italy	Experimental Control Trial	Secondary School	A: 4 B: NR C: NR	N = 24	Experimental group (karate training): age 15.34±0.75; height 1.70±4.16 (m); weight 65.75±3.77 (Kg); BMI 22.75±1.10). Control group: age 15.13±0.58; height 1.68±3.93 (m); weight 63.30±3.93 (kg); BMI 22.44±0.90.	14-16 years old	3	Karate (S)
•	Baiocchi et al. (2017) Year: 2013-2014 Country: Kenya	Cluster-randomised, matched-pairs, parallel trial; Open-cohort design	Primary School	A: 52 B: NR C: 120	N = 5686	Primary school girls	10 to 16 years old	6	Generic Self-defence (N/A)
•	Burt et al. (2021) Year: 2019 Country: Australia	RCT	Private School	A: 6 B: 2 C: 50	N = 46	Female = 23; Male = 23 Mean age 10.95±0.39	10 - 13 years old	4	Mixed Martial Arts, Gymnastics & Parkour (M)
•	Byun et al. (2014) Year: 2013 Country: South Korea	RCT	Taekwon-do learning centre	A: 8 B: 3 C: NR	N = 24	Attained TKD level 2 or higher, differences in shoulder height or leg length; attending an elementary school; separated in arms according to posture problems	13.1 years old	NR	TKD (S)
•	Chau (2021) Year: NR Country: Vietnam	Experimental	UNICEF Safe Schools Program schools	A: 24 B: 3 C: 90	N = 15	Male; high school-aged students	NR	NR	Karate (S)

• Cho, So & Roh (2017) Year: NR Country: Korea	RCT	NR	A: 16 B: 5 C: 60	N = 30	Healthy Elementary school students (Control Group: 9 Boys, 6 Girls, TKD Group: 9 boys, 6 girls); not participating in regular exercise other than PE classes at school; no physical or mental illness	Grades 4-6	2	TKD (S)
• Cicovic et al. (2011) Year: NR Country: Bosnia	Quasi-Experimental/non-experimental	Judo clubs	A: 4 B: 3 C: NR	N = 28	Included in the training process for future judoka involved in the basic preparation training in the judo clubs of East Sarajevo	14 and 15 years old	1	Judo (G)
• Cipra and Hall (2019) Year: NR Country: USA	RCT (Pseudo-random)	Primary School	A: 13 B: 1 C: 45	N = 404	Gender: Control Group = 54.4% male, 45.6% female; Intervention group: 47.2% male, 52.8% female	Grades 4, 5, 7 & 8	4	TKD (S)
• Decker et al. (2018) Year: 2015 Country: Malawi	Cluster-RCT	Primary School	A: 6 B: NR C: NR	N = 4278	Mean age: Primary school=15.28 (SD = 2.06); secondary school= 19.55 (SD = 2.70). Salima district comprised approximately 50% of primary school students, whereas approximately 70% of secondary school students were from Lilongwe.	NR	NR	Generic Self-defence (N/A)
• Decker et al. (2018) Year: 2017 Country: Malawi	Cluster-RCT	Primary/ High school	A: 6 B: 1 C: 120	N = 4278	3311 primary school, 967 high school, female only	Primary classes: 5, 6, 7, & 8; High school forms: 1, 2, 3 & 4	8	Generic Self-defence (N/A)
• DelCastillo et al. (2019) Year: 2018 Country: Spain	RCT	School & participants' homes	A: 9 B: 1 C: 10	N = 459	Control: n=151; Male: 74, Female: 77 Intervention: n=302; Male: 151, Female: 151 Other details provided: Mean age; BMI; Sport participation, Physical Education Mark	6-12 years old	7	Judo (G)

• Ebesugawa et al. (2010) Year: 2009 Country: USA	Mixed method	Community centre	A: 11 B: 2 C: 60	N = 19	11 students with special needs; 8 without special needs;	5 to 17 years old	12	Karate (S)
• Edelman (1994) Year: 1994 Country: USA	Quasi-experimental/non-experimental	High school	A: 12 B: 2 C: NR	N = 15	Economically diverse; rural; emotional disturbances; history of violently disruptive and assaultive behaviours	Middle and high school age	NR	Aikido (G)
• Fung & Lee (2018) Year: 2013 Country: Hong Kong	Cluster-RCT	Private school & participants' homes	A: 6 B: 1 C: 90	N = 298	232 males, 66 females; mean age: 8.60 years (SD = 1.38), from 13 sites	NR	NR	Kung Fu (S)
• Garcia et al. (2021) Year: NR Country: USA	Cross sectional	High school	A: 13.5 B: 2 C: 45	N = 9	89% Male; mean age: 16.87±1.36 years; 78% Caucasian	15-18 years old	4	Judo (G)
• Glanz (1994) Year: NR Country: USA	Qualitative case study	Elementary school	A: NR B: NR C: NR	N = 10	Involved or likely to become involved in gangs; Involved a range of violent and disruptive behaviour	4 students in grade 4; 6 students in grade 5	1	Karate (S)
• Greco et al. (2019) Year: 2019 Country: Italy	RCT	High school	A: 12 B: 1 C: 90	N = 100	50% male, 50% female; Mean age: 14.6±07	14-16 years old	12	Karate (S)
• Greco et al. (2020) Year: 2019 Country: Italy	RCT	Martial Arts Academy	A: 12 B: 2 C: 45	N = 28	24 Male, 4 Female; ASD diagnosis; 8-11 Years	8-11 years old	NR	Karate (S)
• Harwood et al. (2021) Year: NR Country: Israel	Control Trial	High School	A: 26 B: 2 C: 50	N = 49	All male participants; at-risk youths; low socio-economic; mean age: 15.6 (SD = 0.81)	14-17.7 years old	4.7	Karate, Judo & Jujitsu (M)

•	Hemphill et al. (2019) Year: NR Country: New Zealand	Qualitative case study	Community boxing academies	A: NR B: 2 C: NR	N = 41	31 male, 10 female	9-10, 11-13, 14-18 years old	9	Boxing (S)
•	Kim et al. (2013) Year: NR Country: Korea	Cross-sectional/transversal	High school	A: NR B: NR C: NR	N = 60	Male; high school students; Judo experience (3-10 years) OR sedentary (no extra-curricular or home activities)	Control: 17.2 +- 1.2 years old ; Judo Players: 17.2 +- 0.6 years old	1.2	Judo (G)
•	Lakes et al. (2004) Year: 2000-2001 Country: USA	RCT	Elementary school	A: 13 B: 2.5 C: 45	N = 193	Private lower school; 94 boys, 99 girls	Students from grades K-5	5	Moogong Ryu (S)
•	Lakes et al. (2013) Year: 2012 Country: USA	Pilot study/RCT	Public school/PE	A: 39 B: 3 C: 45	N = 60	Gender: Test: F: 52% M: 48%; Control: F 48% M 52%	Mean age: Test = 12.2; Control = 12.3	NR	TKD (S)
•	Lee & Kim (2015) Year: NR Country: Korea	NR	NR	A: 16 B: 5 C: 50	N = 44	Male; in elementary school	8 years old	NR	TKD (S)
•	Ludyga et al. (2021) Year: NR Country: Switzerland	RCT	Martial Arts Academy	A: 13 B: 2 C: 60	N = 42	23 Male, 19 Female; Right-hand dominant; corrected to, or normal eye sight; no regular engagement in MA.	9-13 years old	5	Judo (G)
•	Ma et al. (2018) Year: 2016 Country: Hong Kong	RCT	Martial Arts Academy	A: 12 B: 1 C: 60	N = 145	TKD Group: Mean age: 7.4; M:45, F:6 Control: Mean age: 7.5; M:76, F:18 Other details included: Height; weight; BMI; Calcium intake/day; Physical activity levels; ADHD diagnosis; Dyslexia diagnosis; Autism Spectrum Disorder diagnosis	6-9 years old	4	TKD (S)

• Marusak et al. (2020) Year: NR Country: USA	Single-Arm Trial	Martial Arts Academy	A: NR B: NR C: 60	N = 59	33 males, 26 females; 19 cancer patients, 17 non-cancer patients, 23 siblings.	5-17 years old	13	Non-Specified Traditional Martial Arts (N/A)
• Moore et al. (2021) Year: NR Country: Australia	RCT	School	A: 10 B: 1 C: 50-60	N = 283	136 Male, 143 Female; secondary school students' mean age: 12.76 (SD = .68).	12-14 years old	3	TKD (S)
• Mroczkowski (2013) Year: NR Country: Poland	RCT	Elementary School	A: 52 B: 3 C: NR	N = 211	Male; first degree scoliosis	7-10 years old	3	Aikido (G)
• Mujanovic et al. (2012) Year: NR Country: Serbia	X	Elementary School	A: 8 B: NR C: NR	N = 32	PE class	11-12 years old	1	Karate (S)
• Nauta et al. (2013) Year: 2009 Country: Netherlands	RCT	Regular primary school	A: 8 B: NR C: NR	N = 3317	Participated in regular physical education	grades 5-8	3	N/R
• Ng-Knight et al. (2022) Year: NR Country: England	RCT	Primary School	A: 11 B: 2 C: 45	N = 240	47% Female; Mean age:=9.37 (SD=1.09) mixed-sex, non-selective primary school; 7.5% spoke English as second language; 1.7% had high level of special needs	7-11 years	5	TKD (S)
• Nogueira et al. (2014) Year: 2014 Country: Australia	RCT	Independent schools	A: 39 B: NR C: NR	N = 151	Early-pubertal girls;2 different schools; sound general health; fully ambulatory	Grades 5 and 6 (10.6 +-0.6 years)	0.6	Capoeira (S)

• Roh et al. (2018) Year: NR Country: Korea	RCT	NR	A: 16 B: 1 C: 60	N = 30	Control: 9 Male, 6 Female; mean age: 11.40±0.63. Test: 9 Male, 6 Female; mean age: 11.53±0.64	10-12 years	3	TKD (S)
• Rourke (2017) Year: 2017 Country: Australia	Quasi-Experimental/no control group	PCYC	A: 4 B: NR C: NR	N = 31	High school adolescents; PCYC members; within age restrictions	13-18 years old	5	Boxing (S)
• Shin (2011) Year: 2011 Country: Korea	Cross-sectional/transversal	High school	A: NR B: NR C: NR	N = 60	Female; high school; >5yrs TKD training, OR sedentary	16-18 years old	2	TKD (S)
• Simonovic (2011) Year: NR Country: Serbia	Cross-sectional/transversal	Primary schools	A: NR B: NR C: NR	N = 52	Fifth and sixth grades; regularly participating in school PE classes; Karate athletes; students who did NO sport outside of school	11-12yrs +- 0.5 years old	1	Karate (S)
• Sinclair (2013) Year: NR Country: Kenya	Non-randomised, census based, longitudinal cohort study	High school	A: 6 B: 1 C: 120	N = 522	Low SES, high unemployment rates, slum area	14-21 years old	7	Generic Self-defence (N/A)
• Song (2004) Year: 2004 Country: Korea	RCT	Special high school for the mentally retarded	A: 30.333 B: 3 C: NR	N = 20	Educable, Mentally retarded, high school, male	17-19 years old	2	TKD (S)
• Taylor (2006) Year: 2003 Country: New Zealand	Controlled intervention study	Rural school communities	A: 104 B: NR C: NR	N = 302	Rural; predominantly caucasian (81.8%, 17.3% maori, 0.9% Pacific Island) from middle class backgrounds	5-12 years old	7	TKD (S)
• Trulson (1986) Year: NR Country: USA	Intervention study	NR	A: 26 B: NR C: NR	N =34	Male, categorised as juvenile delinquents according to MMPI	13-17 years old	4	TKD (S)
• Tyshchenko et al. (2018) Year: 2017 Country: Ukraine	Control Trial	School	A: NR B: 4 C: 120	N = 459	Control: N=23; 12 Male, 11 Female. Test: N=22; 12 Male, 10 Female	11-12 years	2	Spas (S)

• Van Rheenen (2011) Year: NR Country: USA	"No formal research agenda"	Public elementary school	A: 12 B: 1 C: 90	N = 24	Under-resourced, underperforming educational setting	Grade 4	NR	TKD (S)
• Yukimoto & Kyan (2021) Year: 2018 Country: Japan	Single-Arm Trial	Junior High	A: NR B: NR C: NR	N = 946	499 Male, 447Female; no prior martial arts experience	NR	NR	Judo (G)
• Zivin et al. (2001) Year: 2001 Country: USA	RCT	Working Class/ welfare receiving area; Middle school	A: 10 B: 3 C: NR	N = 60	Boys; high risk of violence and juvenile delinquency;	22 Grade 6: (Mean age:12.11); 28 Grade 7 (mean age: 13.11); 10 Grade 8 (mean age: 14.30)	2	Koga Ha Kosho Shorei Ryu Kempo (M)
			Duration: Mean:18.10 SD: 19.08 **Sessions p/w:** Mean: 2.15 SD: 1.15 **Session length:** Mean: 66.35 SD: 29.34	Mean: 509.24 SD: 1249.84			Mean: 4.57 SD: 3.25	S: 28 G: 8 M: 3 N/A: 7

NR = Not Reported; N/A = Not Applicable; p/w = per week; SD = Standard Deviation; Year = Year conducted; TKD = Taekwon-Do; Intervention dose: A = Duration of study (weeks); B = Sessions per week; C = Session length (minutes); Martial Arts: Striking(S); Grappling (G); Mixed (M)

Eight studies included male-only participants, five studies included female-only participants, nineteen studies included both male and female participants, and 14 studies did not provide information in relation to the sex of the participants. Six studies intentionally included trained athletes/martial artists. Six studies targeted participants who were deemed as anti-social, or ‘at risk’ students, and four studies included participants with special needs including ‘educable, mentally retarded, high school, males’; children with cancer, Autism Spectrum Disorder (ASD), pervasive developmental disorder, developmental delays, vision impairments, speech delays, cerebral palsy with patent ductus arteriosus and congenital hip dysplasia, club foot, Downs syndrome and first degree scoliosis.

Study design

As Table 3.4 shows in full detail, 12 studies were randomised control trials (RCTs) (including one cluster randomised, and one pseudo-randomised. Three were quasi-experimental/non-experimental (one had no control group), three were cross-sectional/transversal, two were qualitative case studies, three papers had unidentifiable study designs, one study had no formal research agenda, one study presented as a controlled intervention, one study was a feasibility trial, one intervention study was a longitudinal cohort study, one study utilised a mixed method, and one study was a non-randomised census-based parallel trial with an open cohort design.

Duration

Twelve studies had a duration ranging between four and eight weeks. Ten had a duration between nine and 12 weeks, seven had a duration between 13 and 24 weeks, seven had a duration between 25 weeks and 52 weeks, and one study had a duration greater than 52 weeks. The average length of an intervention was 18.10 weeks (SD 19.08) (37 studies provided this information). The average number of sessions per week was 2.15 (SD 1.15) (31 studies provided this information). The average length of each session was 66.35 minutes (SD 29.34) (26 studies provided information relating to duration).

Table 3.4. Study results

Cognitive Outcomes			
Reference	Outcome	Measure	Results
Burt et al (2021)	On-Task behaviour Academic Performance	Time sampling One-minuted basic Number fact test	Non-significant results for on-task behaviour Significant addition and subtraction in test group (p=<0.05)
Cho, So & Roh (2017)	Cognitive functions	1. Stroop Colour and Word Test (Korean version)	> Word and Colour test scores ($p > 0.05$) > Colour-Word test scores ($F = 13.952$, $p = 0.001$)
Decker et al. (2018)	Self-defence confidence	Self-reported self-defence confidence	> self-defence confidence ($p < 0.001$)
Ebesugawa et al. (2010)	Attention	Focus group interviews; Behavioural Assessment System for Children - Second Edition (BASC-2)	< negative behavioural symptom index ($p < .02$)
Greco et al (2020)	Executive function	Behaviour rating inventory of Executive Function (BRIEF)	> Executive functioning ability (cognitive flexibility, inhibitory control and working memory) (p< 0.01; large effect size) < Aggressiveness, sadness, anxiety and hyperactivity compared to the control group (p< 0.01; large effect size)
Harwood et al (2021)	Executive function	CANTAB Battery	> processing speed compared to controls (p=0.001)
Lakes et al. (2004)	Response to challenge (RCS) - cognitive subscale (e.g., distractible—focused); Freedom From Distractibility	Self-Regulation in (RCS) cognitive subscale; Wechsler Intelligence Scale for Children-Third Edition (WISC-III)	> Self-regulation in response to a challenge in intervention group for all three dimensions of self-regulation [Fs (1,174) = 11.18, 7.38, and 3.93, $p < .05$ for cognitive, affective and physical self-regulation, respectively]. Group x Gender interaction for cognitive self-regulation and the interaction approached significance for affective and physical self-regulation as well [Fs(1,174) = 4.43, 2.17, and 1.97; $p < .05$, .15, and .17, respectively]
Lakes et al. (2013)	Executive function; Attention & behaviour control	Hearts and Flowers executive function test; SWAN rating scale	> accuracy on congruent trial ($d = 2.00$, $p = .02$) for Taekwon-Do/intervention group

Ludyga et al (2021)	Neurocognitive indices of response inhibition	Computerized go/No Go task with simultaneous electroencephalographic recordings	Greater decreases in NoGo error rate ($p=0.049$) and a higher increase in NoGo N2 amplitude were found in comparison to the control group. Behavioural and neurocognitive changes were correlated. Neurocognitive indices: P3a amplitude ($p=<0.001$), N2 amplitude ($p=0.019$)
Ng-Knight et al (2022)	Self-regulation Executive function	teacher-rated effortful control, impulsivity, prosocial behaviour, and conduct problems; computer-based assessments of executive functions; and child self-reported expectancies and values to use self-regulation	TKD group were rated by teachers as having fewer symptoms of conduct problems ($p=0.03$) > attentional focus ($p=0.02$) > Executive attention assessed by flanker task ($p=0.001$). TKD group reported higher expectancies and values to use self-regulation and that expectancies and values mediated intervention effects on self-regulation.
Roh et al (2018)	Cognitive function	Stroop colour and word test	Non-significant change
Song (2004)	Pre-motor and motor reaction	EMG analysing device	No sig. diff premotor RT, > improvement in motor RT by the intervention group ($p< .01$)
Zivin et al. (2001)	Attentional self-control	Intermediate Visual and Auditory Continuous Performance test	Consistent > on 3 of 4 measures (Auditory Vigilance; Visual Vigilance; Auditory Prudence) of the IVA computerised test of attentional self-control. Significance difference on Auditory Vigilance: $t(46) = 1.75$, $p = .04$
Psychological Outcomes			
Reference	Outcome	Measure	Results
Abrahams (2004)	Self-concept and Depression	Multidimensional Self Concept Scale; Multi-score Depression Inventory	Statistical analysis did not show significant change. Qualitative reports indicated positive differences in which students handled both in-school and out-of-school challenges.
Baiocchi et al. (2017)	Self-efficacy	Generalised Self-Efficacy Scale (GSES)	> mean generalised self-efficacy score of 0.19 (baseline average 3.1, on a 1–4 scale), $p = 0.0004$ and 95% CI= (0.08, 0.39)
Burt et al (2021)	Mental wellbeing	Stirling Children's Well-Being Scale (SCWBS)	Non-significant results or change scores were found
Cipra and Hall (2019)	Bullying behaviours; sense of community cohesion and trust in the school; school climate; self-esteem	Connor Davidson Resilience Scale & Bullying Compendium; Student School Survey; School Climate Bullying Survey; Child Behaviour Checklist	> School Cohesion and Trust subscale ($t(324) = 3.03$, $p = 0.003$), higher levels for intervention group ($M = 3.69$, $SD = .74$) compared to the control group ($M = 3.90$, $SD = .58$)

			> Self-Esteem scale ($t(402) = -2.98$, $p = 0.003$). Higher in the intervention group ($M = 3.88$, $SD = .64$) than the control group ($M = 3.68$, $SD = .67$) > School Climate scale ($t(402) = 2.21$, $p = 0.028$). Higher scores in the control group ($M = 2.18$, $SD = .52$) than the intervention group ($M = 2.06$, $SD = .62$)
Decker et al (2018)	Self-defence confidence Knowledge of appropriate self-defence techniques	Author-created questionnaire	> Self-defence knowledge observed solely among intervention students (RR 3.33, 95% CI 2.76, 4.02; interaction effect $p < 0.001$).
Ebesugawa et al. (2010)	Social-emotional development	Focus group interviews; Behavioural Assessment System for Children - Second Edition (BASC-2)	< participants’ behavioural symptom index scores for the parent and teacher scales ($p<.02$) < social skill problem s ($p<.06$)
Fung & Lee (2018)	To help aggressive children change their beliefs from valuing revenge and aggression to valuing benevolence and nonviolence, and to learn appropriate scripts	Reactive Proactive Aggression Questionnaire (RPQ) Child Behavioural Checklist –Youth Self-Report (CBCLYSR)	Significant interaction effects for aggressive behaviour (reactive and proactive) ($p=<0.001$), delinquent behaviour ($p=0.033$), anxiety/depression ($p=0.001$), and attention problems ($p=<0.001$). All measures declined in all conditions over time, but only the skills-and-philosophy condition showed a significant reduction at post-training and/or follow-up compared with the placebo.
Greco et al (2019)	Resilience Self-efficacy	Child and Youth Resilience Measure (CYRM-28) Self-Efficacy Questionnaire for Children (SEQ-C)	Significant ‘Time x Group’ interaction was detected for all dependent measures ($p<0.05$); moderate to large effect size. > resilience and self-efficacy ($p <0.05$)
Greco et al (2020)	Assess social skills and problem behaviours	Social Skills Improvement System Rating Scale	> socio-emotional competence (communication, cooperation and engagement), ($p< 0.01$) > executive functioning (cognitive flexibility, inhibitory control and working memory) ($p< 0.01$) < aggressiveness, sadness, anxiety and hyperactivity ($p< 0.01$; large effect size)
Harwood et al (2021)	Self-Esteem Aggression levels	Rosenberg Self Esteem Scale; Self-reported Aggression Scale	No significant differences between the martial arts experimental group and the control group on the key study variable of aggression or self-esteem

Hemphill et al. (2019)	Do youth participants experience the life skills in the boxing program? How do youth participants perceive the life skills impact them beyond the program	Semi-structured focus group interviews	Qualitative reports indicated that while participants reported being motivated to memorise the life skills they acknowledged this could be challenging. Participants noted boxing was a ‘fun’ and ‘challenging’ activity that helped them learn ‘how to build yourself up as a person in general…as a better and healthier person and to get you confident at school, at home, and in the community’. Participants recognised that life skills are relevant to different contexts, and several discussed learning valuable lessons they had learnt that applied beyond the boxing gym.
Lakes et al. (2004)	Self-confidence; emotional control; persistence; will; Student Strength and Difficulties (emotional symptoms, conduct problems, inattention/hyperactivity, peer problems, prosocial behaviour); self-esteem	Response to Challenge Scale (RCS) effective subscale; Goodman's Strength and Difficulties Questionnaire, Teacher Version [SDQT]; Coppersmith Self-Esteem Inventory [SEI] (Self-reported)	> Self-regulation for martial arts group in response to a challenge for all three dimensions of self-regulation [$Fs(1,174) = 11.18, 7.38$, and 3.93, $p < .05$ for cognitive, affective and physical self-regulation, respectively]. > Group differences. Qualified by significant Group Gender interaction for cognitive self-regulation. Interaction approached significance for affective and physical self-regulation [$Fs (1,174) = 4.43, 2.17$, and 1.97; $p < .05, .15$, and $.17$, respectively] > prosocial subscale [$F (1,191) = 4.27$, $p < .05$] in SDQ ANCOVA main effect for group was not significant [$F(1,59) = 1.71$, $p > .10$]
Moore et al (2021)	Resilience	Child and Youth Resilience Measure	> resilience (individual capacities and resources: $p=0.000$; relationship with primary caregiver: $p=0.000$; contextual factors: $p=0.005$) >Total resilience ($p=0.000$)
Roh et al (2018)	Mood state; Sociability	Profile of Mood State-Brief (POMS) Sociability measuring model for juveniles	POMS, tension, and depression scores were significantly lower ($p < 0.05$) after the intervention vigor score was significantly higher in the intervention group ($p < 0.05$). Sociability and 'being left out' score, a sub-variable of sociability, was significantly lower ($p < 0.05$) after the intervention, Sociability score was significantly higher ($p < 0.05$).

Rourke (2017)	Mental wellbeing	Warwick Edinburgh Mental Well-being Scale	> Survey scale score (p < 0.0001, 95% CI: 3.4269–4.0571). The only survey item with a p-value greater than 0.0001 was the item 'I've had energy to spare' (p = 0.0961).
Trulson (1986)	Juvenile delinquency	Minnesota Multiphasic Personality Inventory (MMPI); Aggression test modelled after Navaco (1975); Aggression test derived from responses to 6 Resonzweig Picture Frustration Test items	> MMPI in Group I (p=<0.01) < MMPI Group III experienced a negative effect (p=<0.01)
Yukimoto & Kyan (2021)	Attitudes towards learning Judo: Anxiety, Enjoyment and value of learning	Self-administered questionnaire	< anxiety after learning Judo > enjoyment after learning judo Students reported agreement with the statements "Learning judo will be useful in the future." and "Judo etiquette is useful in everyday life." less agreement with the statement "Physical strength improves as a result of learning judo," after taking judo classes. Male students exhibited increased agreement with the statement "Judo break falls (in Japanese, ukemi) are useful in everyday life." after taking the classes.
Zivin et al. (2001)	Wellbeing; behaviour	Piers-Harris Children's Self-Concept Scale; Sutter-Eyberg Student Behaviour Inventory;	Piers-Harris Children's Self-Concept Scale On 'Happy', t (50) = 1.83, p = 0.4 2. Students consistently decreased across all four types of troublesome behaviour

Physiological Outcomes

Reference	Outcome	Measure	Results
Altavilla et al (2019)	Rapid strength Speed and agility Lower limb strength	Seated medicine ball throw 10x5 shuttle run test Bosco Test	> medicine ball throw (F=6.3, p=0.01) > effect of moment (F=16.8, p=0.001) > squat jump (F=4.7, p=0.014)
Baiocchi et al. (2017)	Sexual assault among girls	Self-reported incidence of sexual assault at the school level on an annualised basis	A 3.7% decrease (p = 0.03) and 95% CI= (0.4%, 8.0%), in risk of sexual assault (7.3% at baseline)
Burt et al (2021)	Cardiovascular endurance Explosive muscular strength Muscular endurance	20m repeated shuttle run test - "Beep Test" Standing depth jump 90° Push-Up Test	> upper body muscular endurance: 90° Push-Up Test (adjusted mean difference = 8.17 [95% CI, 4.01 to 12.33], p=0.000, d = 1.31)

Byun et al. (2014)	Posture correction	A digital camera (DHC-H50, Sony, Japan) was used to record posture; Neck, shoulder, and pelvis inclinations were examined using Posture pro 7 (PP7, Ventura Designs, USA).	<Front and back inclination from 10.2 degrees to 5.8 (p<0.05) < Right and left inclination from 2.9 degrees to 0.8 (p <0.05) <Shoulder inclination from 1.4 degrees to 0.6 (p <0.05) <Pelvis inclination from 1.6 degrees to 0.5 (p <0.05)
Chau (2021)	Physical strength	Repeatedly jerking hands in 30 seconds (times) Alternately straight punching in kiba-dachi in 10 seconds (times) Repeatedly cross-punching to the target in 15 seconds (times) Roundhouse kicking with front and back legs to the target in 15 seconds (times) Cross-punching and roundhouse kicking to the target in 15 seconds (times)	>Repeatedly jerking hands in 30 seconds (times) (+11.01%) >Alternately straight punching in kiba-dachi in 10 seconds (times) (+20.23%) >Repeatedly cross-punching to the target in 15 seconds (times) (+16.93%) >Roundhouse kicking with front and back legs to the target in 15 seconds (times) (+19.68%) >Cross-punching and roundhouse kicking to the target in 15 seconds (times) (+13.51%)
Cho, So & Roh (2017)	Brain-derived neurotropic factor (BDNF); Vascular endothelial growth factor (VEGF); Insulin-like growth factor-1 (IGF-1); Cerebral blood flow; VO2 Max; BMI	Blood sample; 2-MHz pulsed Doppler ultrasound; Modified Balke treadmill protocol; BMI: height/weight squared	> Serum BDNF (F = 9.142, p = 0.005), VEGF (F = 4.664, p = 0.040), and IGF-1 levels (F = 4.376, p = 0.046)4. > VO2max (F = 7.371, p = 0.011)6. No significant difference in BMI (p > 0.05)
Cicovic et al. (2011)	Motor and functional abilities	Segmentary speed tests (Hand tapping [MTAP], foot tapping [MTAN], foot tapping against wall [MTPZ]); Explosive strength tests (Standing depth jump [MSDM], standing triple jump [MTRS], standing quintuple jump [MPTS]); Functional abilities (Heart rate after load [FPPOP], Maximum anaerobic power [FMARG], Vital lung capacity [FVKPL])	Segmentary Speed: >MTAP, T - value (-4.14), p = .040; MTAN, T - value (-4.26), p = .036; MTPZ, T - value (-3.87), p = .0452. Explosive strength: >MSDM, T - value (5.28), p = .001; MTRS, T - value (5.04), p = .013; MPTS, T - value (5.17), p = .0113. Functional abilities: >FPPOP, T - value (-5.18), p = .011; FMARG, T - value (-4.19), p = .041; FVKPL, T - value (-4.46), p = .031

Decker et al (2018)	Past year prevalence Past year incident rate of forced sex	Self-reported, single item questionnaire used for Kenya-based evaluations of IMPower, specifically, "Since you took the No Means No survey or in the past one year, have you ever been forced against your will to have sex (penetration of your vagina, anus or mouth with a man's penis or another object)?" with a follow-up question "If so, how many times?".	< Prevalence 9.2% (Risk Ratio (RR) Intervention 0.59 [95% CI 0.49–0.72]), while control arm prevalence remained approximately steady at 14.5% (RR Control 1.04[0.86–1.26]); interaction effect p-value < 0.001. < Overall incident rates (16.3; Rate Ratio; Intervention = 0.82 [0.67–1.00]), and increased in the control arm (24.0; Rate Ratio Control = 1.22[0.95–1.57]. Overall interaction effect favoured the intervention arm (p-value =0.01).
Decker et al. (2018)	Past year prevalence Past year incidence rate of forced sex	Self-reported, single item questionnaire	< sexual assault prevalence among intervention students (risk ratio [RR] 0.68, 95% CI 0.56, 0.82; interaction effect p < 0.001) > self-defence knowledge among intervention students (RR 3.33, 95% CI 2.76, 4.02; interaction effect p < 0.001) Favourable reductions were also observed in sexual violence incident rate among students overall (interaction effect p = 0.01)
DelCastillo et al (2019)	Risk of injury during a backward fall Assess the effect of the Safe Fall training program on this risk	Information Scale on Safe Ways of Falling observation scale	< risk, with percentages lowered to levels between 8.7% and 18.3%
Ebesugawa et al. (2010)	Motor Development	Unipedal Stance Test	37% of students able to stand for longer on every trial, 58% of students were able to balance for more time in at least one trial
Edelman (1994)	Disruptive and/or assaultive behaviours	Videotaped analysis of student behaviours; Number and frequency of disciplinary referrals written for violent behaviour	On average (out of 15), students (n) refrain from: Disruptive classroom behaviour during each activity session (n=11); verbally abusive behaviour towards students or staff members during each activity session (n-12); physically assaultive behaviour towards students or staff members during each activity session (n=13); 8 exhibit a reduction in school-wide referrals for violent behaviour

Garcia et al (2021)	Feasibility	Attendance register 5-point Likert scale participant survey Semi-structured teacher interview	High attendance throughout, with 8/9 students attending 92% of classes; No significant differences between in-person and online, but positive statements slightly higher for in-person sessions Teachers view online as beneficial by promoting structure and opportunities for PA during a pandemic.
Harwood et al (2021)	Oxytocin levels (OT) Cortisol levels (CT)	Saliva sampling and analysis	First regression model was significant ($p < 0.001$), explaining 47% of the adjusted variance. OT reactivity significantly predicted change in processing speed, such that higher hormonal reactivity was related to faster speed of processing ($p = 0.001$, BF10 = 89.9). In the second regression analysis, analyzing predictors of change in self-esteem, the overall regression model was significant ($p = 0.02$), explaining 30% of the adjusted variance. Overall CT response was found to be a significant predictor, such that higher response predicted increase in self-esteem ($p = 0.007$, BF10 = 3.43).
Kim et al. (2013)	Bone health; Bone mineral density	Dual-energy X-ray absorptiometry	Forearm, lumbar spine and femur BMD in the Judo group was significantly greater by 22.7%, 24.5%, and 18.3%, respectively. A significant difference in the Control group was observed between the dominant hand (DH) radius (0.710 ± 0.074 g/cm2) and the non-dominant hand (NDH) radius (0.683 ± 0.072 g/cm2), but this was not observed in the Judo group (DH = 0.819 ± 0.055 g/cm2; NDH = 810 ± 0.066 g/cm2) ($p < 0.05$)
Lakes et al. (2013)	BMI/BMI z scores	CDC BMI growth charts/BMIz scores	Differences in mean residualized change scores for BMI z scores yielded a moderate, non-significant effect size ($d = -.51$, $p = .16$)
Lee & Kim (2015)	Physical fitness; growth index depending on different IGF-1 gene polymorphisms	Height (standing & sitting), weight, overall fat & body fat (Inbody3.0); BMI calculated; blood sample; Bone maturity: bone age, bone score and expected height analysed using TWII method; grip & back strength test; sit-up test; sit and reach test; standing long jump test; repetitive side jump; Unipedal test; Harvard step test.	> expected height of the non-carrier group ($p < 0.05$) > grip strength and Unipedal test for Homozygote group and the non-carrier groups ($p < 0.05$) Physical fitness and growth index among the gene polymorphism groups indicated no significant differences.

Ludyga et al (2021)	Fine motor skills Gross motor skills	Movement Assessment Battery for Children-2 (MABC-2) Physical Work Capacity test on a bicycle ergometer at 170 bpm (PWC170)	Non-significant change in MABC-2 or PWC170
Ma et al (2018)	Skeletal development Motor performance	Ultrasonography using the Sunlight BonAge system Movement Assessment Battery for Children (MABC) Computerized Eye-Hand Coordination (EHC) Test	TKD group had a significant delay in skeletal development at baseline compared to the control group ($p = 0.003$) but caught up with the controls at 3 months ($p = 0.041$) > EHC movement time at 3 ($p = 0.009$) and 6 months ($p = 0.016$) in TKD Group.
Marusak et al (2020)	Pain and emotional distress levels	Coloured Analog Scale Modified FACES scale Friedman test	< pain ($p = 0.033$) after a 1-hr class < emotional distress ($p < 0.001$) after a 1-hr class 50% and 89% of youth reporting a reduction in pain and distress, respectively.
Mroczkowski (2013)	Angles of the sagittal plane on anteversion of the pelvis in children	Determination of the location of the apices of spinous processes from C7cervical process to L5 lumbar process; Posturometer-S	< pelvic anteversion angle ($p < 0.01$) No effect of aikido exercises on alpha, beta and gamma angles of spinal curvatures was found in the sagittal plane.
Mujanovic et al. (2012)	Functional abilities	Resting Heart Rate, Pulse rate after load, vital lung capacity	Significant difference in all tests of functional abilities ($p=0.000$)
Nauta et al. (2013)	Fall-related injuries	Physical activity questionnaire; continuous fall-related injury registration.	Not significant (P=>0.05)
Nogueira et al. (2014)	Bone quality and fat levels	Stretch stature method - Stadiometer; Digital scales; Anthropometric tape measure; Maturity Algorithm - Mirwald and colleagues; Maximal vertical Jump (Yardstick); 20m shuttle run test [Beep Test]); Resting heart rate (radial pulse); Stethoscope & Sphygmomanometer and cuff; Questionnaires; Calcaneal ultrasound (BUA; SI) ; Dual-energy X-ray absorptiometry	> BUA for intervention group (+4.5% vs. +1.4%, $p= 0.019$). > Resting heart rate (−7.2% vs.−1.8%, $p = 0.01$), maximal vertical jump (+13.4% vs.−1.2%, p b 0.001), estimated maximal oxygen consumption (+10.6% vs. +1.0%, $p = 0.001$), and waist circumference (+2.7% vs. +5.6%, $p = 0.001$) also improved more for intervention group

Roh et al (2018)	Cardiorespiratory Endurance/VO2Max Strength Flexibility Power Balance	VO2max: Nemeth protocol on treadmill Digital grip (GRIP-D, Takei, Tokyo, Japan) and back strength (BACK-D, Takei, Tokyo, Japan) measuring equipment Sit-and-reach test Sargent jump Stork test	> Balance (Stork Test) in TKD group ($p < 0.05$)
Shin (2011)	Lumbar and femoral bone density (BMD)	Dual-energy X-ray absorptiometry	Lumbar spine and femoral BMD were not significantly different between light, middle and heavy body weight groups. > Average BMD in the intervention group for all lumbar spine regions ($P<0.05$).
Simonovic (2011)	Motor abilities	Standing long jump; triple jump; quintuple jump; Foot taping; hand taping; taping feet against the wall; Trunk lifting on Swedish bench; mixed pull-ups; squats; Agility in the air; coordination with a bat	> motor abilities in favour of karate athletes in standing long jump (MSDM $p = 0.011$); triple jump (MTRS $p = 0.000$); quintuple jump (MPTS $p = 0.000$) > repetitive strength in favour of karate athletes in trunk lifting on the Swedish bench (MDTK $p = 0.000$); mixed pull-ups (MMZG $p = 0$ .000); squats (MČUČ $p = 0.000$) > Coordination in favour of karate athletes in agility in the air (MOKV $p = 0.000$); coordination with a bat (MKOP $p = 0.006$)
Sinclair (2013)	Incidence of sexual assault	Questionnaire	< assaults by boyfriends ($p < .0004$) and relatives ($p < .002$) in intervention group > Disclosure rates in the intervention group (55.6% to 97.1%; $p< .0001$)
Taylor (2006)	Weight gain in children.	Portable stadiometer; Electronic scales; Rabone Metal Diameter Tape; Automated Sphygmomanometer; 2000 centre for Disease Control reference BMI norms; Mini-Matter unidirectional Actical Accelerometers	Average accelerometry counts at 1 year were 28% (95% CI: 11 to 47%) higher in intervention; Intervention children spent less time in sedentary activity (ratio 0.91, $p = 0.007$); Intervention children spent more time in moderate (1.07, $p = 0.001$), and moderate/vigorous (1.10, $p = 0.01$) activity; Adjusted mean BMI Z-score was lower in intervention relative to control children by –0.12 units (95% CI: –0.22 to –0.02)

Tyshchenko et al (2018)	Strength Speed Agility Endurance Flexibility.	Push-ups (number of reps) Long Jump (cm) Sit Up (number of reps) 60 Meter Sprint(s) Jumping rope (number of times); 4x9 m shuttle run (s); Jumping from a squatted position (number of reps); Sit and Reach (cm) Shoulders rotation of the stick (cm).	> Push-Ups (p=<0.05) (Girls only) > Long Jump (p=<0.05) (Boys and Girls) > Sit and Reach (p=<0.05) (Boys and Girls)
Zivin et al. (2001)	Reduced permanent expulsion	Expulsion from school	All 6 permanent expulsions were from Group B. Difference between groups was significant (p = 0.012).

> = increase; < = decrease

Sample Size

One study did not provide a sample size, 10 studies had a sample size between 51 and 200 participants, 14 studies had a sample size >200. The most common sample was <50 participants (n=21 studies).

Country & year conducted

Although 23 studies do not state the date of implementation in the paper, their publication date was used in the absence of their year of conduction. Studies were most commonly conducted in the United States (n=12).

Physiological outcomes

Thirty-one studies included physiological outcomes. Four investigated body composition (BMI and/or weight and/or obesity), six investigated motor and/or functional ability, five investigated biomarkers (growth index depending on different IGF-1 gene polymorphisms; various blood measures; brain-derived neurotropic factor (BDNF); vascular endothelial growth factor (VEGF); insulin-like growth factor-1 (IGF-1); cerebral blood flow; VO_2 max; oxytocin and cortisol levels), four studies investigated bone health/density, three investigated posture/skeletal alignment, four investigated sexual assault incidence/prevalence, two studies investigated reducing expulsion rates and/or disruptive/assaultive behaviours, two studies investigated fall-related injuries, and one investigated response to challenge (skilfulness). The measures used to assess physiological outcomes of studies varied considerably, so only common assessments were used to compare study results (e.g., studies reporting BMI or dual-energy X-ray absorptiometry were used to report body composition outcomes). Statistically significant change in favour of MA/intervention groups was found in the following areas: medicine ball throw (p=0.01); upper body muscular endurance (p=0.000) (Reference 1); OT reactivity (p=0.001); risk of sexual assault (p=0.03) (Baiocchi et al., 2017; Decker et al., 2018);

posture correction: front and back inclination ($p<0.05$), right and left inclination ($p<0.05$), shoulder inclination ($p<0.05$), pelvis inclination ($p<0.05$) (Byun et al., 2014); BDNF ($p=0.005$), VEGF ($p=0.040$) and IGF-1 levels ($p=0.046$) (Cho et al., 2017); segmentary speed tests: hand tapping (MTAP) ($p=0.040$), foot tapping (MTAN)($p=0.036$) and foot tapping against a wall (MTPZ) ($p=0.0452$) (Cicović et al., 2011); explosive strength: standing depth jump (MSDM) ($p=0.001$), triple standing jump (MTRS)($p=0.013$) and quintuple standing jump (MPTS) ($p=0.0113$) (Cicović et al., 2011); functional abilities: heart rate after load (FPPOP) ($p=0.011$), maximum anaerobic power (FMARG) ($p=0.041$) and vital lung capacity (FVKPL) ($p=0.031$) (Cicović et al., 2011); reduction of sexual assault prevalence ($p<0.001$) and increased self- defence knowledge (Decker et al., 2018); forearm, lumbar spine and femur bone mineral density (BMD) significantly greater than control by 22.7%, 24.5% and 18.3% respectively (Kim et al., 2013); difference between dominant hand (DH) radius and the non-dominant hand radius observed in control, but not in test group ($p<0.05$) (Kim et al., 2013); greater self-regulation in response to a challenge than children in the comparison group for dimensions of self-regulation (cognitive, affective and physical self-regulation) ($p<0.05$) (Lakes & Hoyt, 2004); increase in grip strength, and unipedal stance test ($p<0.05$) (Lee & Kim, 2015).

Psychological outcomes

Eighteen studies included psychological outcomes. Three investigated wellbeing, eight investigated increases of pro-social behaviour (including bullying, aggression, delinquency, and peer interaction), seven investigated self-esteem and/or self-confidence and/or self-concept, and two investigated self-efficacy. Again, there was no similarity of measures across studies; however, two of the nine studies used focus group interviews. These studies reported results in favour of MA training in: Child and Youth Resilience Measure (CYRM-28); Self-Efficacy Questionnaire for Children (SEQ-C); Minnesota Multiphasic Personality Inventory

(MMPI), reduced aggressiveness, and the Jackson Personality Inventory (JPI); overall self-concept and a decrease in key depression subscales, as well as positive differences in which students handled both in-school and out-of-school challenges; socio-emotional competence (communication, cooperation and engagement); overall wellbeing; increase in mean generalised self-efficacy score; School Cohesion and Trust subscale, Self-Esteem scale, and School Climate scale; Behavioural Symptom index scores, decrease in social skill problems; greater self-regulation in response to a challenge for all three dimensions of self-regulation (cognitive, affective, and physical self-regulation), Prosocial subscale; Student Behaviour Inventory. From these studies, two did not include a statistical analysis. Of the remaining studies, 13 indicated statistical significance in the following: aggressive behaviour (reactive and proactive) ($p=<0.001$), delinquent behaviour ($p=0.033$), anxiety/depression ($p=0.001$) and attention problems ($p=<0.001$) (Fung & Lee, 2018); self-defence knowledge ($p=<0.001$) (Decker et al., 2018); resilience and self-efficacy ($p<0.05$) (Greco, Cataldi & Fischetti, 2019); resilience (individual capacities and resources: $p=0.000$; relationship with primary caregiver: $p=0.000$; contextual factors: $p=0.005$), and total resilience ($p=0.000$) (Moore et al., 2021); socio-emotional competence (communication, cooperation and engagement) ($p<0.01$), executive functioning (cognitive flexibility, inhibitory control and working memory)($p<0.01$), and aggressiveness, sadness, anxiety and hyperactivity ($p<0.01$; large effect size) (Greco & de Ronzi, 2020); self-regulation ($p=<0.05$) (Lakes & Hoyt, 2004); Profile of Mood State-Brief (POMS), and sociability scores ($p=<0.05$) (Roh et al., 2018); aggressiveness scores ($p<0.01$) in traditional MA group (Trulson, 1986); generalised self-efficacy ($p=0.0004$) (Baiocchi et al., 2017); the School Cohesion and Trust subscale ($p=0.003$), Self Esteem Scale ($p=0.003$), and School Climate scale ($p=0.028$) (Cipra & Hall, 2019); behavioural symptom index scores for the parent and teacher scales ($p<0.02$) (Ebesugawa, Wensley & Murphy-Sims, 2010); teacher-rated resistance to rules, inappropriate social behaviour and impulsivity ($p<0.05$) (Zivin et al., 2001); Warwick Edinburgh Mental Well-being Scale (p=0.0001) (Rourke & Wilson, 2017). All results are shown in full detail in Table 3.4.

Cognitive Outcomes

Table 3.4 shows that 13 studies included measures of cognition. Of these 13, five investigated self-control, self-regulation and/or attention/focus, four investigated executive function, two investigated cognitive function, and single studies investigated academic performance, self-defence confidence, changes in neuroplasticity, and pre-motor and motor reaction. Each of these studies used heterogeneous measurement instruments, except for two which shared a common instrument – the Stroop Colour and Word test. Eleven out of these 13 studies had statistically significant results in at least one cognitive measure in favour of the MA groups, including: Performance on Colour-Word test scores (p=0.001) (Cho et al., 2017); academic performance (Reference 1); processing speed (p=<0.001) (Harwood-Gross et al., 2021); self-defence confidence (p<0.001) (Decker et al., 2018); neurocognitive indices: P3a amplitude (p=<0.001), and N2 amplitude (p=0.019) (Ludyga et al., 2021); conduct problems (p=0.03), attentional focus (p=0.02) and executive attention assessed by flanker task (p=0.001) (Ng-Knight et al., 2021); Negative Behavioural Symptom Index (p<0.02) (Ebesugawa et al., 2010); cognitive, affective and physical self-regulation (all p's <0.05) (Lakes & Hoyt, 2004); congruent trial (p=0.02) (Lakes et al., 2013); executive function (p<0.01) (Greco & de Ronzi, 2020); and auditory vigilance (p=0.04) (Zivin et al., 2001). Ten of the 11 studies that reached statistical significance were RCTs. The remaining study that reached statistical significance was a mixed method/case series study measuring outcomes of a single group (Ebesugawa et al., 2010).

Discussion

The aim of this systematic review was to identify school- and community-based interventions utilising MA training to target improved cognitive, psychological and physiological outcomes in children and adolescents. Of the 46 eligible studies, physiological outcomes were most commonly assessed and reported, and most studies were rated as having moderate to high risk of bias. Furthermore, most studies involved small samples of less than 50 participants, and there was great heterogeneity of measures across studies for psychological outcomes and cognitive outcomes.

Physiological Outcomes

This review revealed that MA training is associated with a range of physiological improvements including posture correction (Byun et al., 2014), bone health (Shin et al., 2011), and functional abilities (Cicović et al., 2011). Consequently, the physically active nature of MA training lends itself to the possibility of improving a range of physiological outcomes. These findings align with that of Ciaccioni et al. (2019). Review level evidence is congruent with other systematic reviews that state participation in other forms of physical activity, such as football, can have wide-ranging physiological benefits and that physical activity plays an important role in the prevention of metabolic, cardiovascular, musculoskeletal health risk factors in children (Fong Yan et al., 2018; Mota et al., 2016). This comparability of results between MA training and other sports may have potentially significant implications for the increased implementation of MA training in the prevention of numerous health issues. Martial arts training draws from a range of body systems (e.g., cardiovascular and muscular) and includes a variety of challenging physical demands, depending on the training session content focus. Further research into the additional or differentiated benefits of MA compared to general physical activity may reveal greater benefits than those already identified in this study.

Psychological Outcomes

Statistically significant improvements in multiple psychological measures were achieved using MA in several school and community intervention programs; however, the size of effect was difficult to determine, as most studies did not calculate or report effect sizes. Improvements in generalised self-efficacy (Baiocchi et al., 2017), school cohesion and trust, self-esteem (Cipra & Hall, 2019), social behaviour and impulsivity (Zivin et al., 2001) were observed. A recent 'umbrella' systematic review by Dale et al. (2019) summarises evidence from previous systematic reviews between 2010 and 2017, and identifies that physical activity seems to be an effective intervention for improving self-perceptions, as well as reducing depression/depressive symptoms. The authors note, however, that additional high-quality research and moderator analyses are required to provide stronger evidence and make a more decisive statement regarding the causality of the research findings (Dale et al., 2019). The importance of personal relationships for psychological wellbeing is well documented (Adamczyk, 2017). Furthermore, the connections between physical activity in children and improvements in physical and psychological health may be attributed to positive peer relationships associated with sport (Fraser-Thomas & Côté, 2006). Often, the mental health benefits facilitated through participation in individual and team sports surpass the positive outcomes achieved through involvement in exercise programs or recreational activities, which is observed across different sports and sub-populations (Eime et al., 2013; Howie et al., 2020; Mills, Dudley & Collins, 2019; Vella et al., 2017). MA may provide a unique environment to foster such relationships with frequent exchanges of trust with peers that share similar interests. For example, when students practise MA techniques, they often put each other in physically vulnerable positions and must trust their peers not to injure them (Chinkov & Holt, 2016). This is quite a unique factor of MA training, and an important interaction, as trust is contingent on risk (Fattore & Mason, 2017).

Cognitive Outcomes

The results of this systematic review demonstrate that MA may have potential for facilitating improvements in cognitive outcomes in children aged 5–17 years (Reference 1; Cho et al., 2017; Decker et al., 2018; Ebesugawa et al., 2010; Lakes et al., 2013; Lakes & Hoyt, 2004; Zivin et al., 2001). This is an important finding, as cognitive abilities have been shown to have a strong relationship with academic performance in children (Nesayan et al., 2019). The neurobiological mechanisms that link physical activity and cognitive performance are unclear but may be a consequence of a change in the structural and functional composition of the brain (Lubans et al., 2016). A systematic review by Donnelly et al. (2016) highlights that single bouts of physical activity, and physical activity interventions generally, benefit children's physical fitness levels and cognitive functioning. Most MA incorporate some form of strength-based activities into their training sessions, whether this is sport-specific exercises or otherwise. This may be a contributing factor to the significant cognitive improvements, as resistance training has also shown to have a positive effect on cognition (Landrigan et al., 2019). The findings supporting the cognitive impact of MA training in children and adolescents warrant further investigation, and potential exploration in school-based settings.

Other factors

Setting: While several (n=5) studies did not report the setting, when comparisons are made between the results from the 32 school-based and the 10 community-based studies, setting was not reported as a significant factor. Investigations into differences of effect between community-based and school-based interventions is still somewhat unexplored; however, Heath et al. (2012) note that both settings can be effective environments to foster positive change. This shows a comparability with this study. The comparability of results between community- and school-based interventions, regardless of the significant difference in average length, may indicate that interventions with shorter durations (<12 weeks) may be effective while increasing feasibility due to less time and resources being required.

Taught by school teacher or martial arts instructor: There were very few MA programs that were taught specifically by, or partially taught by school teachers (n=2). With so few studies taught by classroom teachers, a reliable comparison is unable to be made. However, both school teacher-inclusive studies reported some level of positive change, indicating that this may not be a significant factor. This is reflective of previous studies that investigated this difference, such as that of Lander et al. (2017), who also find positive results in both groups but state an inadequate amount of information made it difficult to draw conclusions.

Content: The content of MA programs varied extensively, given the breadth of MAs available, making any comparison of content difficult.

Intervention dose: The duration (in weeks) (Mean: 18.10±19.08), sessions per week (Mean: 2.15±1.15), and length of session (Mean: 66.35±29.34) also somewhat reflected those of other effective physical activity interventions (Brown et al., 2013).

Strengths, Limitations and Recommendations

There were several methodological limitations found in the existing studies, including limited high-quality quantitative (e.g., RCT) designs (n=25). A lack of detail in key areas was also an area of limitation. e.g. sample size was inconsistently reported, and many did not provide sex of participants (Abrahams, 2004; Byun et al., 2014; Cicović et al., 2011; Ebesugawa et al., 2010; Edelman, 1994; Glanz, 1994; Mujanović et al., 2012; Nauta et al., 2013; Rourke & Wilson, 2017; Simonović et al., 2011; Sinclair et al., 2013; Taylor et al., 2006; Van Rheenen, 2011), which resulted in an inability to make meaningful comparisons between male and female participants. Inconsistent and/or vague presentation of participant age also creates unnecessary difficulty in interpreting and presenting the studies. A large percentage (n=21) of studies also had small sample sizes (<50 participants). Additionally, when one considers the vast array of MA around the world, very few were studied, with a clear lack of studies focusing on grappling-based arts or mixed martial arts.

Strengths and limitations of this systematic review must also be considered. This review is, to the author's knowledge, the first of its kind. It therefore fills an important gap in the literature and provides valuable information and suggestions for future research projects. However, some limitations arise. The review only included three databases (MEDLINE Complete, SPORTDiscus with Full Text, and SCOPUS). A search of more databases may have returned more eligible studies for this review and should be considered for future systematic reviews on this topic. Further to this, while results were interpreted and comparisons were made, a numerically-based meta-analysis of the results was not conducted as part of this systematic review. It is recommended that this be done for any further reviews of this literature.

The knowledge gained from the results of this study allows the authors to provide a number of recommendations for future studies. These recommendations include larger sample sizes, greater detail in key areas (e.g., sample characteristics), as well as greater detail of content delivered (e.g., a sample lesson) and who sessions are taught by and what their qualifications are. RCTs are also recommended to be used when conducting further studies in this area.

Conclusion

Key findings from this review support that MA interventions have the potential to lead to improvements in physiological, psychological, and cognitive outcomes in children and adolescents in both school and community settings. Further studies are needed to explore the extent of the benefits and whether benefits of MA differ across sub-populations. Our findings present a foundation for further investigations exploring the utility of MA interventions delivered in school and community settings for facilitating improvements in cognitive, psychological and physiological outcomes in young people.

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Reference 1 - Removed to maintain anonymity of authors

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Chapter 4. Study 2 – The Kick-Smart program

4.1. Introduction to paper

The systematic review highlighted a gap in current literature surrounding intervention programs that use martial arts as the catalyst for learning and change. Additionally, such programs as do exist lack modern martial arts, gymnastics or acrobatics elements. This gap presented an opportunity to provide a program that adds depth to a limited field. The design of the program took into consideration what was already known, as well as what appeared to be lacking in the field. For example, it has been shown by Nosanchuk and MacNeil (1989) that aggression levels in young people have a tendency to increase if they are only taught fighting techniques without any elements of tradition or ethical development. This was considered, and resulted in each Kick-Smart session concluding with a 10-minute discussion relating to ethical development. Similarly, the previous paper also highlighted a lack of martial arts programs that involved grappling, wrestling or gymnastics/parkour movements. This gap was taken into account and elements of these were included in the design of the program. In terms of adding depth, as few papers included in the systematic review included feasibility measures, such a measure was intentionally included in this study. Furthermore, the inclusion of feasibility measures allowed for informed judgements to be made regarding the justification of larger scale studies of the program being implemented in the future (Bowen et al., 2009). Feasibility measures also provided valuable input about the content of the program and whether any changes were required to improve the program or its delivery.

The pedagogy of the Kick-Smart program is discussed prior to the results of the pilot study of this program, which are presented in the following publication:

Burt, L. D., Riley, N., Parkes, R. J., & Eather, N. (2021). The Kick-Smart program: a randomised feasibility trial evaluating the feasibility and efficacy of a primary-school based martial arts program integrating mathematics, physical fitness and well-being. *Journal of Education and Training Studies*, 9(3), 47-57. https://doi.org/10.11114/jets.v9i3.5142

4.2. Pedagogy of the Kick-Smart program

4.2.1. Special needs

The Kick-Smart intervention was designed to allow all students in mainstream Stage 3 classes (Grades 5 and 6) to access and engage in each activity and perform all techniques and skills in the program. Reasonable adjustments were made to accommodate special needs through collaborative consultation with the class teachers. Some adjustments were potentially unable to be achieved without compromising the quality of the activities for the other students, and could jeopardise the outcomes of the study; therefore, alternative activities were provided for such students.

4.2.2. Student engagement

The activities in the Kick-Smart program were designed to achieve maximal engagement through the inclusion of the SAAFE (Supportive, Active, Autonomous, Fair, Enjoyable) Teaching Principles (Lubans et al., 2017), developed and published by the Priority Research Centre for Physical Activity and Nutrition at the University of Newcastle, in collaboration with the Institute for Positive Psychology and Education at the Australian Catholic University and the Psychology of Exercise, Health and Physical Activity Laboratory at the University of British Columbia. Each lesson aimed to include as many of the following SAAFE principles as possible:

1. Be SUPPORTIVE in your teaching. Take the perspective of the students, provide a rationale for what you are doing, create meaningful connections, use language that is not strict or controlling, and demonstrate emotional support or involvement. Examples of this may include providing individual skill specific feedback or praising student effort and improvement.
2. Maximise opportunities for individuals to be physically ACTIVE by including high levels of physical activity and minimal transition time. This can best be achieved by planning for participants to engage in play multiple mini games to maximise student involvement, and avoiding elimination games.
3. Create an AUTONOMOUS environment by providing students with choice and offering graded tasks. Examples of this might be to allow students to choose the music within the lesson or involve students in the modification of the activities/rules.
4. Design and deliver FAIR lessons by providing all students with opportunities to experience success in the physical domain. This will take into account considerations that ensure students are evenly matched in activities and encourage self-comparison rather than peer-comparison.
5. Provide an ENJOYABLE experience targeted to the interests and strengths of the group, as people tend to persist with activities they find intrinsically motivating. Participation is enhanced when popular or enjoyable activities begin and conclude the sessions, and exercise is never used as a punishment but, rather, as an intrinsically and extrinsically rewarding activity.

4.2.3. Behaviour management

Misbehaviour was defined as any moment in time where a student is disrupting the learning of others in any way, challenging authority figures, threatening the wellbeing of others, or any combination of these behaviours. These behaviours were discussed with the students at the beginning of the program with the intention of highlighting clear and high expectations, and explicitly communicating any predicted or possible misdemeanours and provide consistent, clear consequences for breach of behavioural expectations that might result in exclusion from some activities, or possibly the program if the behavioural misdemeanours were severe enough.

4.2.4. Progression of behaviour management

All students are susceptible to becoming disengaged and/or displaying some (or all of) the unacceptable behaviours at some point as discussed above and outlined in Table 4.1 below. Therefore, rather than having a 'zero tolerance' policy, the following progression was followed when managing negative behaviour.

Table 4.1. Progression of behaviour management

<table>
<tr><th>Step</th><th>Disrupting others</th><th>Challenging Authority</th><th>Threatening wellbeing of others (or themselves)</th></tr>
<tr><td>1</td><td colspan="3">Low level intervention (i.e. 'The Look', gesture to stop talking, move to the student's proximity (McDonald, 2013)</td></tr>
<tr><td>2</td><td colspan="3">Gentle reminder of expectations (i.e. what the task is) and offer assistance</td></tr>
<tr><td>3</td><td>De-escalating statement:
I'm sure your friend is interested in what you have to say, but it needs to wait until after class.</td><td>De-escalating statement:
I'm interested in what you have to say, but now is not the best time, so let's talk about it after class.</td><td>Due to the nature of the program, if the behaviour continues, proceed to step 5.</td></tr>
<tr><td>4</td><td colspan="3">Offer a 'choice':
Example:
1. I would like you to stop talking and continue with the activity
2. If you choose to continue talking, I will need you to swap partners with someone
3. I will give you half a minute to chose
4. Follow through</td></tr>
<tr><td>5</td><td colspan="3">Notify the student that if the behaviour continues, they will be excluded from the current activity and will sit with the classroom teacher (and follow through if necessary)</td></tr>
<tr><td>6</td><td colspan="3">Notify the student that if the behaviour continues, they will be excluded from the remainder of the session and will sit with the classroom teacher (and follow through if necessary). If the student continues this behaviour over multiple sessions, they may be excluded from the program. What they do during this time will be at the discretion of their class teacher (i.e. sit with the teacher and watch, join a 'buddy class', work in the office under executive supervision)</td></tr>
</table>

Adapted from Chapter 6: Re-engaging the disengaged learner, in *Classroom Management – Engaging Students in Learning* (McDonald, 2013).

4.3. Statement of contribution of others

By signing below I confirm that Mr Louis Burt contributed substantially in terms of study concept and design, data collection and analysis, and preparation of the paper/publication entitled to the paper/publication entitled *The Kick-Smart program: A randomised feasibility trial evaluating the feasibility and efficacy of a primary-school based martial arts program integrating mathematics, physical fitness and well-being.*

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4.4. The Kick-Smart program: A randomised feasibility trial evaluating the feasibility and efficacy of a primary-school based martial arts program integrating mathematics, physical fitness and well-being.

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Abstract

The objective of this study was to evaluate the feasibility and efficacy of the 'Kick-Smart' martial arts program using a randomised controlled-trial conducted in one Australian primary school. Kick-Smart involved children 9–11yrs (n=46) randomised into treatment or wait-list control conditions. Kick-Smart consisted of 2×60 min curriculum sessions/week for six weeks during school hours. Positive feedback was received from students and teachers regarding program enjoyment, perceived benefits and future plans. Significant treatment effects favouring the Kick-Smart group for muscular fitness and mathematics achievement demonstrates preliminary efficacy. Findings indicate Kick-Smart is feasible for delivery in a primary school setting and effective for improving selected fitness and academic outcomes. Further evidence for the effectiveness of Kick-Smart via a larger randomised control trial is recommended.

Key words: education; physical activity; martial arts; mathematics; wellbeing; randomised-controlled trial;

Introduction

National physical activity guidelines recommend that children and adolescents engage in at least 60 minutes of moderate to vigorous daily physical activity for achieving good health (Vetter et al., 2018). Despite the well published and extensive physiological, psychological and cognitive benefits of physical activity, many children and adolescents worldwide do not acquire the minimum amount required to achieve health benefits (Joschtel et al., 2019)

Physical inactivity has been linked to a large number of preventable health issues, including obesity, hypertension, metabolic disease (Joschtel et al., 2019) and a range of mental health problems (Biddle et al., 2019; Hanrahan et al., 2019). In 2018, metabolic disease and/or childhood obesity was evident in approximately 26% of school-aged Australian children (Vetter et al., 2018). Recently there has been wide-scale research investigating relationships between physical activity and cognitive functioning and mental health in young people (Biddle et al., 2019), with evidence for causal relationships between cognitive function, academic performance, anxiety, and depression emerging (Biddle et al., 2019; Hanrahan et al., 2019). However, investigation into the links between physical activity and mental health issues remains a domain requiring greater documentation among varied populations and settings (Biddle et al., 2019).

Concern over the overcrowding of school curriculums, due to increased demands on primary school teachers brought about by high stakes testing, has been a contributing factor to decreased student physical activity levels throughout the school day (Mavilidi et al., 2018). This is concerning, as teachers in NSW, Australia, are required to provide 150 minutes of structured physical activity throughout the school week, as per the NSW Schools physical activity policy (NSW Government, 2019). Similarly, in the United States the National Association for Sport and Physical Education (NASPE) also recommends that all elementary school students participate in ‘physical education’ for a minimum of 150 minutes per week, and a minimum of 225 minutes for middle and high school students (Keener et al., 2009). It has been suggested that schools may be more willing to prioritise healthy lifestyle programs if the aims of said programs align with the schools' core business of learning (Mavilidi et al., 2020).

Mental health is at the forefront of wellbeing in young people, with issues such as anxiety and depression representing one of the largest burdens of disease for adolescents globally (Gunnell et al., 2018). Wellbeing is a multifaceted construct that includes an individual's physical, mental, emotional and social health (Pressman et al., 2013). A positive state of wellbeing and enjoyment can lead to greater confidence and self-efficacy and broadened abilities to think in innovative, creative ways and problem solve effectively (Department of Education and Communities, 2015). In this positive context, learning occurs more effectively (Department of Education and Communities, 2015). Biddle et al. (2019) note in their recent study that the evidence for physical activity and mental health (depression, self-esteem) remains less well documented for children and adolescents.

The integration of physical activity across key learning areas of the curriculum may have benefits that reach beyond that of health improvements (Tomporowski et al., 2008). There is growing evidence that enhanced physical activity may improve academic performance (Mavilidi et al., 2018; Mavilidi et al., 2020). Furthermore, a recent review by Álvarez-Bueno et al. (2017) provides evidence to support the role of physical activity in cognitive development in children and adolescents, and concludes that enhanced academic achievement is positively linked to increased physical activity.

'Martial arts' is a collective term that encompasses the multitude of fighting and self-defence systems developed and implemented around the world (Rousseau, 2019). Despite emerging evidence over the past decade that martial arts training may facilitate positive change in psychological and cognitive outcomes, and evidence for causal relationships between cognitive function, academic performance, anxiety, and depression in children and adolescents

(Biddle et al., 2019), a recent systematic review (under review) has highlighted a lack of high-quality investigations using a randomised control trial (RCT) to gather evidence for the feasibility and utility of school-based martial arts training for school-aged children.

Of a limited number of curriculum-based physical activity interventions where activity has been used to teach or reinforce academic concepts in primary schools, none to our knowledge has reported the benefits of a curriculum-based martial arts program on physical fitness, academic achievement, and social and emotional wellbeing. Therefore, the aim of this unique study was to evaluate the feasibility and efficacy of the 'Kick-Smart' program for integrating mathematics skills and mental wellbeing into martial arts lessons in the primary school, and in turn provide a basis for a larger definitive trial in the future.

Methods

The Kick-Smart program was conducted at one independent school in Newcastle, New South Wales (NSW), Australia, from July to September 2019. Study approval was sought and obtained from the University of Newcastle Research Ethics Committee, and the principal and teachers from the study school. Information statements, as well as parental consent and participant assent forms, were sent home with students. Those who returned signed consent forms were permitted to participate in the study. The study design was a randomised controlled trial (RCT), and involved primary school children aged 9–11 years. The design, conduct and reporting of the Kick-Smart program adhered to the Consolidation Standards of Reporting Trials (CONSORT) guidelines (Eldridge et al., 2016) for reporting randomised pilot and feasibility trials. Two classes of Year 5 students were recruited, and the numbers in the pilot trial were based on the class sizes – which were conveniently evenly sized with relatively even numbers of males in and females in each class. Following baseline assessments, a randomisation envelope was prepared by the research team. A blinded independent third party allocated the classes into one of the two groups (by class) into either control or treatment conditions by choosing one of the two classes and then choosing and opening one of the two opaque envelopes that both contained a piece of paper that said either ‘test’ or ‘control’. The control class continued with their regular Physical Education lessons and school sport sessions, programmed by the school, while the treatment group participated in the Kick-Smart program during their class’s timetabled Physical Education lessons and school sport sessions.

Intervention protocol

The Kick-Smart program addressed specific outcomes for Personal Development Health and Physical Education (PDHPE) and Mathematics from the NSW Board of Studies PDHPE and Mathematics syllabi (NSW Education Standards Authority, 2012, 2018) using a movement-based learning experience to reinforce mathematics concepts that focused primarily on single digit addition, subtraction, multiplication, and division. These movement-based experiences involved a variety of aerobic and muscular fitness exercises, and techniques from a range of martial arts including Taekwondo, Karate and Pankration (Table 4.1).

Each Kick-Smart session was planned to last for 60 minutes and concluded with a discussion on ethical development, focusing on a particular ethical aspect, including self-control, integrity and courage. Participants attended two sessions per week for six weeks (12 in total). Each session was designed collaboratively by the research team, drawing on their extensive teaching experience, and taught by a member of the research team (LB) who is a qualified primary school teacher and martial arts instructor. All sessions were observed by the classroom teacher and the school’s specialist PDHPE teacher. No rewards were offered for participating in the study.

Outcomes

The primary outcome for this study was feasibility. Process evaluation measures of recruitment, retention, adherence, compliance, and satisfaction were used to assess program feasibility. Secondary outcomes included measures of physical fitness, academic achievement, mental wellbeing, and cognition, which were assessed using instruments validated for use with children, many of which have been used in previous studies by the research team.

Primary Outcome – Feasibility Analysis

As shown in Table 4.2, Recruitment was calculated by the percentage of permission slips returned from the total number of participants invited. Retention was calculated by the percentage of students who completed baseline assessments and follow-up assessments. Adherence was calculated using the average attendance rates of the students over each of the 12 Kick-Smart sessions. Compliance was calculated using the percentage of the number of classes that were carried out as planned. Satisfaction was calculated using the average scores for enjoyment of the program, and enjoyment of each component, from the student feedback questionnaire (Costigan et al., 2015).

Secondary Outcomes

Physical Fitness

Physical fitness was assessed using standard protocols for the following three measures: cardiorespiratory fitness (CRF) using 20 m repeated shuttle run test, otherwise known as 'the beep test'; muscular fitness using standing broad jump test (explosive leg power), and the 90° push-up test (Henriques-Neto et al., 2020).

Mental wellbeing

Mental wellbeing was assessed using the Stirling Children's Well-Being Scale (SCWBS), which consisted of 15 items measuring positive emotion (n=6), positive outlook (n=6) and social desirability (n=3) subscales (Liddle & Carter, 2015). Each of the subscales provided a separate score. In addition, each of the subscale scores were added together for a total score.

Cognition

Cognition was assessed using the Trail Making Test (TMT) (Reitan, 1958), which provides a measure of visual attention, speed, scanning, speed of processing and mental flexibility. It involved a two-part visual task (Trail A and B) where participants were required to, first, draw a line from one point to the next as quickly as possible to connect numbers in ascending order (e.g., 1-2-3 etc.); and, second, draw a line from one point to the next as quickly as possible to connect both numbers and letters in an ascending and alternating order (e.g., 1-a-2-b-3-c etc.) The task was timed and errors recorded, with lower scores indicating greater cognitive performance.

Academic achievement

Children's achievement in mathematics was assessed using the One Minute Basic Number Fact Test (OMBNFT) (Westwood, 2013). Students completed the four columns of the OMBNFT. Students were allowed one minute per column, with a short break (20–30 seconds) in between columns.

Statistical analysis

The analyses of efficacy outcomes were performed using IBM SPSS Statistics version 20 and all variables were checked for normality and missing values. Data are presented as mean scores (and standard deviation: SD) for continuous variables. Linear mixed models were used to assess all outcomes for the impact of group (Kick-Smart vs control), time (treated as categorical with levels at baseline and six weeks) and the group-by-time interaction, with these three terms forming the base model. Mixed models are robust to the biases of missing data and provide appropriate balance of Type 1 and Type 2 errors (Mallinckrodt et al., 2004). Mixed model analyses are consistent with the intention-to-treat principle, assuming the data are missing at random (White, Carpenter & Horton, 2012). Cohen's d was also calculated, and interpreted as follows: d=0.2, 'small' effect size; d=0.5, 'medium' effect size; and d=0.8, 'large' effect size (Vacha-Haase & Thompson, 2004).

Table 4.2. Kick-Smart Program Summary

Week	Lesson	Martial arts focus	Ethical focus	NSW PDHPE syllabus outcomes	NSW Mathematics Syllabus outcomes
1	1	Movement / Self-Preservation	Courage	PD3-4, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11	MA3-4NA, MA3-1WM, MA3-2WM
	2	Movement / Parkour	Respect	PD3-3, PD3-4, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11	MA3-6NA, MA3-1WM, MA3-3WM
2	3	Self-Defence (e.g. escaping wrist grabs)	Integrity	PD3-1, PD3-3, PD3-4, PD3-5, PD3-7, PD3-8, PD3-9, PD3-10	MA3-6NA, MA3-5NA, MA3-2WM
	4	Blocking/ deflecting/ dodging basic attacks		PD3-1, PD3-3, PD3-4, PD3-7, PD3-8, PD3-9, PD3-11	MA3-2WM, MA3-1WM, MA3-6NA
3	5	Blocking/ deflecting/ dodging basic attacks	Self-Control	PD3-2, PD3-3, PD3-4, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11	MA3-1WM, MA3-5NA, MA3-6NA
	6	Striking (with arms)		PD3-2, PD3-3, PD3-4, PD3-5, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11	MA3-1WM, MA3-2WM, MA3-5NA, MA3-6NA
4	7	Striking (with legs)	Loyalty	PD3-3, PD3-4, PD3-8, PD3-9, PD3-10, PD3-11	MA3-1WM, MA3-2WM, MA3-6NA
	8	Team-building	Teamwork	PD3-4, PD3-5, PD3-6, PD3-7, PD3-8, PD3-9, PD3-10	MA3-1WM, MA3-3WM, MA3-5NA, MA3-6NA
5	9	Wrestling/Grappling	Honesty	PD3-3, PD3-4, PD3-5, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11	MA3-1WM, MA3-6NA
	10	Wrestling/Grappling		PD3-3, PD3-4, PD3-5, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11	MA3-1WM, MA3-6NA
6	11	MMA	Perseverance	PD3-2, PD3-4, PD3-5, PD3-8, PD3-9, PD3-10, PD3-11	MA3-1WM, MA3-2WM, MA3-3WM, MA3-5NA
	12	Martial Acrobatics		PD3-2, PD3-4, PD3-8, PD3-9, PD3-10, PD3-11	MA3-1WM, MA3-5NA

NSW PDHEPE Syllabus Outcomes: PD3-1: identifies and applies strengths and strategies to manage life changes and transitions; PD3-2: investigates information, community resources and strategies to demonstrate resilience and seek help for themselves and others; PD3-3: evaluates the impact of empathy, inclusion and respect on themselves and others; PD3-4: adapts movement skills in a variety of physical activity contexts; PD3-5: proposes, applies and assesses solutions to movement challenges; PD3-6: distinguishes contextual factors that influence health, safety, wellbeing and participation in physical activity which are controllable and uncontrollable; PD3-7: proposes and implements actions and protective strategies that promote health, safety, wellbeing and physically active spaces; PD3-8: creates and participates in physical activities to promote healthy and active lifestyles; PD3-9: applies and adapts self-management skills to respond to personal and group situations; PD3-10: selects and uses interpersonal skills to interact respectfully with others to promote inclusion and build connections; PD3-11: selects, manipulates and modifies movement skills and concepts to effectively create and perform movement sequences. NSW Mathematics Syllabus Outcomes: MA3-1WM: describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions; MA3-2WM: selects and applies appropriate problem-solving strategies, including the use of digital technologies, in undertaking investigations; MA3-3WM: gives a valid reason for supporting one possible solution over another; MA3-4NA: orders, reads and represents integers of any size and describes properties of whole numbers; MA3-5NA: selects and applies appropriate strategies for addition and subtraction with counting numbers of any size; MA3-6NA: selects and applies appropriate strategies for multiplication and division, and applies the order of operations to calculations involving more than one operation

Results

The flow of participants through the study is displayed in Figure 4.1. Forty-eight (n=48) students were given information statements and consent forms. Forty six (n=46) children from Grade 5 (mean age=10.95 ± 0.39 years; Female=23, Male=23) were deemed eligible and randomised at the class level (intervention: 21 students, 11 males, 10 females; control: 25 students, 12 males, 13 females).

Primary Outcome

Process evaluation results (Table 4.3) show a recruitment rate of 92% with 46 out of 48 students returning signed consent forms to participate in the study. From the 46 recruited participants, 44 students completed baseline assessments and follow-up assessments (96% retention). Student attendance rates were high (85.66% adherence); however, this may be attributed to the sessions being held within curriculum time. Scores on the evaluation survey completed by the 21 students (100% of participants) in the intervention group showed that students rated the Kick-Smart program >4 out of 5 for enjoyment, perceived benefits and future plans – indicating high to very high satisfaction rates. Both teachers completed and returned the teacher evaluation questionnaire of the program. Both teachers agreed or strongly agreed when asked if they felt confident that they could deliver some of the content ($\underline{x}$=4.5). Both agreed that after some professional development sessions, they could confidently deliver the Kick-Smart program ($\underline{x}$=4). Both teachers strongly believed the program was of value ($\underline{x}$=5). The teachers also indicated strongly that they would implement the program In the future ($\underline{x}$=4.5), and strongly agreed that the activities were targeted at the right level ($\underline{x}$=5). A total of 10 of the 12 sessions were completed as intended (83.33% compliance). Additionally, no injuries were sustained by any of the participants – indicating a degree of safety surrounding the sessions.

Table 4.3. Feasibility results (Australia, 2019)

Student feasibility

	Recruitment	Retention	Adherence	Satisfaction	Compliance
Maximum score	48	46	12	5	12
Results	46	44	10.2792	4.4	10
Score as %	92%	96%	85.66%	88%	83.33%

Satisfaction subscale

	Perceived Benefits	Enjoyment of the program	Future plans	Enjoyment of components	$\underline{x}$ of all sections
Maximum score	5.0	5.0	5.0	5.0	5.0
$\underline{x}$ **Results**	4.1	4.4	4.0	4.3	4.2

Staff feasibility results

Question	Max. Score	$\underline{x}$ results	Score as %
I am confident that I could deliver some of the Kick-Smart activities	5.0	4.5	90%
I am confident that, after some professional development sessions, I could confidently deliver the Kick-Smart Program	5.0	4.0	80%
I believe the Kick-Smart program was of value	5.0	5	100%
I would implement the Kick-Smart program in the future	5.0	4.5	80%
I think the activities were targeted at the right level	5.0	5	100%

Secondary Outcomes

As displayed in Table 4.4, the Kick-Smart class scored higher than the control class in almost every area that was assessed at baseline. For example, the Kick-Smart class was more physically fit in each of the three tested areas: Beep Test (laps) (22.51 ± 13.46), compared to the control class (13.37 ± 15.51); the 90° Push-Up (9.34 ± 9.54), compared to the control class (7.50 ± 7.83); and the Standing long jump (m) (1.33 ± .212), compared to the control class (1.30 ± .234). Of note, however, the control class was more competent in the OMBNFT (addition) (24.92 ± 5.19) compared to the Kick-Smart group (22.92 ± 5.71).

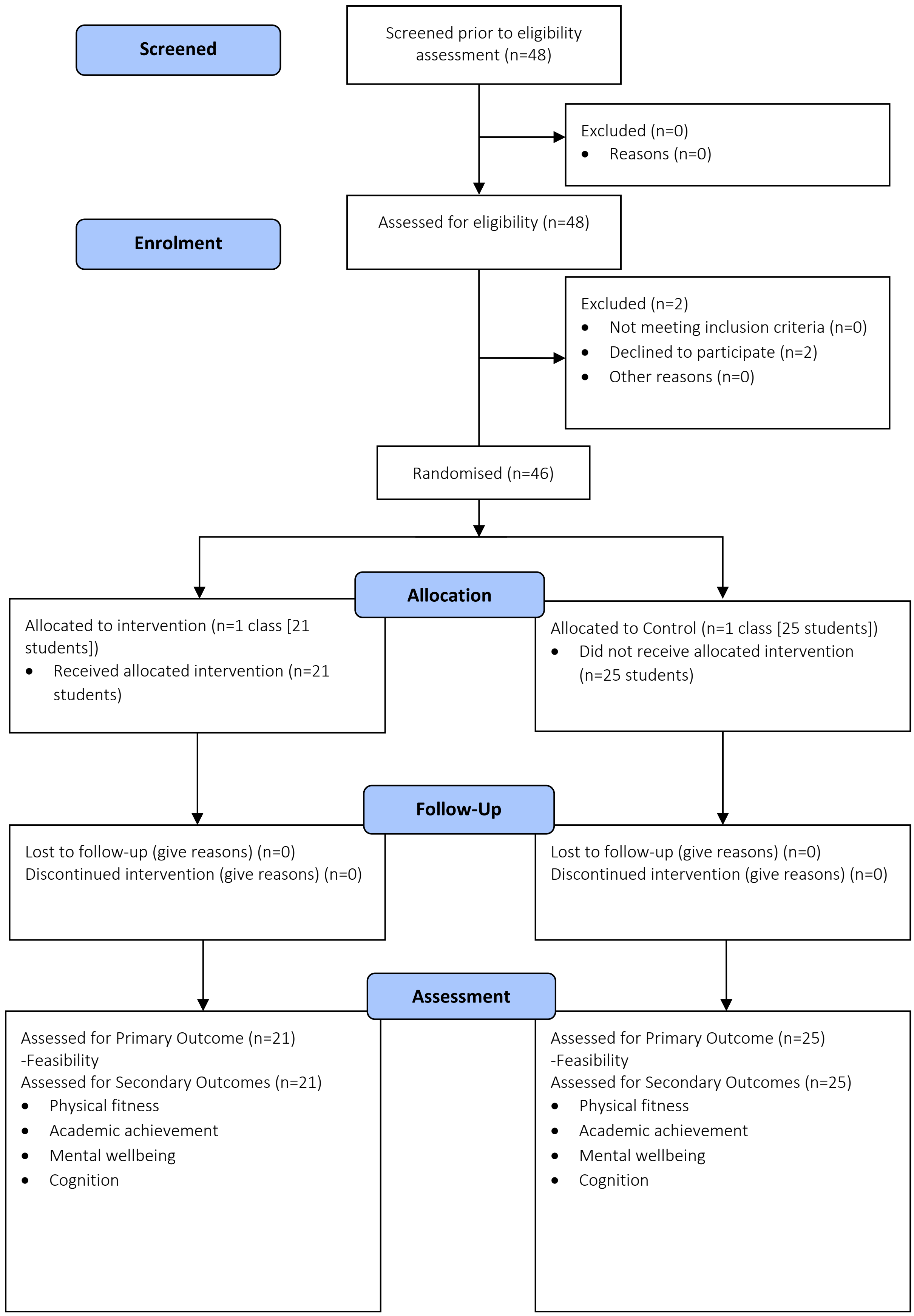

Figure 4.1. Flow of participants through the study.

Physical fitness

Effect linear mixed models showed significant group-by-time effects favouring the Kick-Smart group upon follow-up assessment. Statistically significant improvements were found on the 90° Push-Up Test [adjusted mean difference=8.17 (95% CI, 4.01 to 12.33), p=0.000, d=1.31], indicating a positive impact on upper body muscular endurance. A significant effect was found in favour of the control group for the Beep Test (CRF) [adjusted mean difference=−9.16 (95% CI, −15.77 to −2.55), p=0.008, d=0.89]. No significant effects were found for the Standing Long Jump (ELP) [adjusted mean difference=−0.02 (95% CI, −.08 to .05), p=0.661, d=0.14].

Wellbeing

No statistically significant results or change scores were found in any section of the Stirling Children's Well-Being Scale.

Cognition

Although no statistically significant change was observed in cognition, a small change score (d=0.23) was observed in the Trail Making Test A, in favour of the control group.

Academic performance

Effect Linear mixed models showed significant group-by-time effects favouring the Kick-Smart group upon follow-up assessment. Statistically significant improvements were found in the addition section of the One Minute Basic Number Fact Test (OMBNFT) [adjusted mean difference=4.74 (95% CI, 2.52 to 6.95), p=0.000, d=1.29]. Additionally, results from OMBNFT-Multiplication approached significance [adjusted mean difference=1.77 (95% CI, −.04 to 3.60), p=0.055, d=0.53], showing a medium-sized score change, also favouring the Kick-Smart group.

Table 4.4. KICK-SMART Study intervention effects (by treatment group) – All Outcomes (Australia, 2019)

Measure	Control Group (n=25)				KICK-SMART (n=21)				Adjusted Difference in Change (95% CI)[a]	Group* Time P value	Cohen's d Effect Size
	Baseline	SD	6-week posttest	SD	Baseline	SD	6-week posttest	SD			
Beep Test (laps)	13.37	15.51	26.88	13.55	22.51	13.46	26.85	15.41	−9.16 (-15.77 – −2.55)	0.008	0.89
90° Push-Up	7.50	7.83	7.27	6.64	9.34	9.54	17.27	14.18	8.17 (4.01–12.33)	0.000	1.31
Standing long Jump (m)	1.30	.234	1.33	.27	1.33	.212	1.34	.18	−0.02 (−.08 – .05)	0.661	0.14
OMBNFT (+)	24.92	5.19	25.57	5.75	22.92	5.71	28.31	4.07	4.74 (2.52 – 6.95)	0.000	1.29
OMBNFT (-)	20.26	7.91	22.58	7.43	20.84	8.24	23.43	7.44	0.26 (−2.40 – 2.93)	0.842	0.06
OMBNFT (x)	18.29	7.96	19.55	6.10	19.60	8.16	22.63	7.92	1.77 (−.04 – 3.60)	0.055	0.53
OMBNFT (÷)	12.22	10.33	12.91	9.25	14.35	8.48	15.99	8.79	0.95 (1.99 – 3.88)	0.518	0.12
Positive Emotion	23.01	4.30	22.19	3.63	23.00	3.91	22.55	4.39	0.38 (−1.88 – 2.64)	0.737	0.03
Positive Outlook	22.51	3.83	22.92	2.47	22.60	3.89	23.39	3.70	0.38 (−1.88 – 2.65)	0.734	0.11
Social Desirability	9.98	1.92	10.29	1.39	10.68	2.27	10.79	2.31	−0.20 (−1.33 – .93)	0.726	0.11
SCWBS Total Score	55.51	7.62	55.42	6.45	56.26	8.42	56.66	8.87	0.49 (−3.78 – 4.76)	0.818	0.00
Trail Making Test A	35.97	10.53	30.49	9.50	29.37	6.40	25.061	8.63	1.17 (−2.90 – 5.23)	0.566	0.23
Trail Making Test B	83.67	26.38	62.51	21.15	82.95	30.36	64.58	22.66	2.80 (−13.49 – 19.09)	0.731	0.17

Discussion

The aim of this study was to evaluate the feasibility and efficacy of the ‘Kick-Smart’ program, for integrating mathematics skills and mental wellbeing into PE curriculum-specific martial arts lessons in the primary school. Feasibility measures showed that the program was highly enjoyable for students and rated highly by their class teachers. These results parallel the findings of other school-based physical activity programs (Mavilidi et al., 2018). Overall, the Kick-Smart program was delivered as intended. However, the sessions were designed to run for 60 minutes and, due to timetabling of the school test, the sessions only ran for 40–50 minutes. Additionally, booking issues with the hall in which the sessions were taught resulted in two sessions being taught either outdoors or in a small room with inadequate space to complete the activities as intended. These changes required minor variations to the lessons, as well as creating unsettled behaviour from students; however, this allowed for an opportunity to run these sessions in a smaller area (classroom), which proved successful. This, in turn, showed that the program, or aspects of the program, are able to be taught within regular classrooms, and thus allows for greater generalisability for teachers wanting to run this program in the future.

The results of this study showed statistically significant group-by-time effects, and effect sizes favouring the Kick-Smart group in muscular fitness. This aligns with the findings of Cicović et al. (2011), who found improvements in repetitive strength (among other areas), in favour of martial arts participation; and those of Eather, Morgan and Lubans (2013), whose curriculum-based PDHPE program for Stage 3 primary school children, run once per week for one school term, also found improvements in muscular fitness. The correlation of these results further supports the impact that physical activity and martial arts-based intervention programs can have on the physical fitness of children. These findings are important, as previous studies have shown an inverse relationship between muscular fitness and cardiovascular disease, adiposity, and metabolic risk factors in children and adolescents (Smith et al., 2014). Results from the Beep Test and standing long jump test showed greater improvements in the control class. It is noteworthy that the control class participated in their regular PDHPE classes through the course of the intervention. The control class spent the term performing drills from, and playing the game of, touch football – which often requires explosive leg strength and cardiovascular fitness for movements such as jogging, sprinting and dodging – which may explain the increase in cardiovascular endurance and explosive leg strength seen in the control class. Importantly, the Kick-Smart class did not experience a deterioration in any of the fitness assessments.

Although not all areas of the One Minute Basic Number Facts assessment improved to a statistically significant level, it is important to note that the control class did not experience a deterioration in any of these areas, and the average score for each improved to a higher level than the control class, significantly or otherwise. Additionally, the meta-analysis conducted by Álvarez-Bueno et al. (2017) found that physical activity benefits numerous aspects of academic achievement, particularly mathematics-related skills, reading, and composite scores in youth. Albeit the results from the subtraction, multiplication and division sections of the OMBNFT did not reach significance, the similarity of the findings from this study is noteworthy, as it adds further support to this field of research and further supports the suggestion that school-based martial arts or physical activity programs can effectively improve a range of physiological and academic outcomes in a way that is enjoyable for the students and supported by teachers, which has been seen in other studies of similar nature (Mavilidi et al., 2020). One may suggest that a longer intervention may yield statistically significant results in these area.

The program did not have a statistically significant impact on wellbeing, but it is noteworthy that both classes experienced a deterioration in one area of the SCBWS (Positive Emotion). As seen in Table 4.3, the Kick-Smart group experienced less of a drop in this area (−0.45) than the control class (−0.82), which may indicate a positive effect of the intervention.

Although this is a null finding, it is noteworthy that the majority of the participants scored high in wellbeing at baseline, which may have acted as a ceiling effect and limited the potential for further improvements. This is consistent with the ceiling effect explanation for the null findings for previous child and adolescent physical activity and wellbeing research (Schmalz et al., 2007; Walters & Martin, 2000) for wellbeing outcomes such as self-esteem. For example, Schmalz et al. (2007) note that most female participants reported high levels of self-esteem at baseline, thus decreasing the ability to identify a positive association between physical activity and self-esteem. A variety of other factors may have influenced the wellbeing of the Kick-Smart participants; for example, students may have had a negative social experience in their classroom or peer group, some may have had negative interactions at home, perhaps with parents not supporting or recognising the child's own perspective of their current wellbeing – i.e. feeling stressed (Department of Education and Communities, 2015). Despite these null findings, other studies have shown that school-based physical activity interventions can positively influence youth wellbeing (Costigan et al., 2019), which suggests that further research in this area is needed.

Another conspicuous outcome was the cognitive test (Trail Making Test A) resulting in a small positive change score in favour of the control class. This, again, may be attributable to activities the control class participated in throughout their school day. As this was such a small study, a larger study may yield different results.

Strengths, limitations and recommendations

This is a unique and innovative program that specifically integrates physical fitness, wellbeing and academic achievement within the primary school PDHPE and Mathematics curriculums. The study used trained assessors and observers for all assessments and observations. Clearly an additional benefit to school-based curriculum interventions is that unless a child leaves the school they remain in the study for its full duration; as such, retention rates are expectedly high. There are some major limitations that should be noted. While results of the study are positive, it is worth noting that the program was delivered by the researcher, a qualified primary school teacher, with several years teaching experience and extensive martial arts knowledge. Further studies will need to evaluate the effectiveness of classroom teachers in delivering the program to assess both the sustainability and useability of the program in the school setting. The single biggest barrier to the integration of this program may be teachers' own beliefs, perceptions and attitudes towards martial arts. It has been shown that social support provided by classroom teachers arbitrates changes in children's physical activity behaviours. It therefore seems imperative that teachers have input into the planning of subsequent studies. Indeed, a recent systematic review has highlighted the need for teachers to act as agents of change and to be involved in the delivery of subsequent programs to improve the cost effectiveness, sustainability and feasibility of programs (Erwin et al., 2012). A key part of this will need to be gaining an understanding of teachers' beliefs, perceptions and attitudes towards martial arts and the integration of such into school settings. Furthermore, professional learning focusing on up-skilling teachers in this area will be needed. It is possible that factors outside the intervention may have been responsible for the greater increase in the 20 m repeated shuttle run test results among participants in the control group from baseline to follow-up. Despite this being a group RCT, the intervention was carried out in a single school and the analysis could not take into account clustering. While the authors cannot be sure as to why there was a greater improvement among the control group, it is worth noting that the control group were participating in regular PDHPE lessons, which were based on touch football. Activities from these sessions may or may not have influenced the cardiorespiratory endurance of the control group.

It is important to note that many interventions do not last beyond the study period. In efforts to increase ecological validity, providing teachers with training and professional learning may be of use, so that they may continue to deliver lessons that integrate martial arts and physical activity in a flexible way that can be adjusted to the needs of their class. Insufficient time, limited professional development opportunities and access to resources have been reported by a group of teachers as the main barriers to providing classroom-based physical activity to Australian students (Macdonald et al., 2019). The successful integration of multiple Key Learning Area outcomes into a single program, such as the Kick-Smart program, may be an effective approach to addressing the issue of over-crowded curriculums, and improving physical fitness throughout the school week (Mavilidi et al., 2018).

Based on the flow of the program, and feedback and discussions with teachers and researchers, it may be useful to program the lessons to run for a maximum of 45–50 minutes, rather than the originally intended 60 minutes. This may be more applicable for primary school settings, as it may fit within timetable teaching sessions with greater ease. A further recommendation may be to utilise a different measure of wellbeing in future studies, as this did not yield any significant results.

Conclusions

Preliminary findings indicate that Kick-Smart is feasible for delivery in primary schools, and is effective for improving fitness and mathematics outcomes. Building further support for effectiveness of Kick-Smart via a larger RCT in varied locations and school settings is recommended.

Practical implications

- Martial arts may be a viable catalyst to improve fitness and academic outcomes in school-aged children.
- A school-based martial arts program that targets NSW Syllabus outcomes can be enjoyable for children.
- Teachers may be willing to implement a school-based martial arts program in their schools and classrooms.

- Teachers may view martial arts as a valuable topic to include in schools and classrooms.

Other information

Ethical Approval

This study was approved by the Human Research Ethics Committee at the University of Newcastle, Australia. Approval number: H-2019-0057.

Protocol

The protocol for this trial is currently unavailable.

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Chapter 5. Study 3 – The Kick-Smart Homework Program

5.1. Introduction to paper

The Kick-Smart program, as discussed in the paper presented in the previous chapter (Burt et al., 2021), demonstrated feasibility and efficacy in a primary school setting, producing positive increases in physiological and academic outcomes. Based on the literature review and this pilot study of the Kick-Smart program, as well as evidence supporting the utility of homework in academic success (which will be outlined in the following paper), a homework-based version of Kick-Smart was developed, implemented and assessed for feasibility and efficacy. The following research study outlines this process and the results from the study.

Burt, L. D., Riley, N., & Eather, N. (Submitted 1 March 2023). The Kick-Smart Homework program: the implementation and assessment of a martial arts-based homework program integrating mathematics and physical fitness for primary school children. *Education 3-13* (Under review).

5.2. Statement of contribution of others

By signing below I confirm that Mr Louis Burt contributed substantially in terms of study concept and design, data collection and analysis, and preparation of the paper/publication entitled *The Kick-Smart Homework program: the implementation and assessment of a martial arts-based homework program integrating mathematics and physical fitness for primary school children.*

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5.3. The Kick-Smart Homework program: The implementation and assessment of a martial arts-based homework program integrating mathematics and physical fitness for primary school children.

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Abstract

Background: Overall mathematics performance amongst 15-year-old Australian children has decreased since 2003, as has the number of top-performing students in mathematics between 2012 and 2018. Most Australian children aged 5–17 years also lack the fundamental movement skills (FMS) required to successfully participate in a range of physical activities and sports. Consequently, novel and engaging opportunities for children to develop mathematics skills and FMSs are needed. A previous school-based physical activity program (Kick-Smart) effectively combined martial arts and mathematics skills to target improved academic and fitness-related physiological outcomes in primary school children. Extending this program using the lens of the socio-ecological model, the Kick-Smart homework program was designed to further engage children in an enjoyable martial arts-inspired FMS and mathematics learning program outside of school hours.

Objective: The primary objective of this study was to determine feasibility and efficacy of Kick-Smart homework program.

Method: A single Stage 2 primary school class was recruited as a convenience sample (NSW Australia), with consenting students (mean age=8.86) randomly assigned to the six-week

Kick-Smart homework program (n=13; mean age=8.9), or active control group (n=13; mean age=8.82) who continued with their regular school homework schedule.

Measures: A modified version of the Programme for International Student Assessment scales; One Minute Basic Number Fact Test; Trail Making Test; 20 m repeated shuttle run test; standing broad jump; 90° push-up test; and Test of Gross Motor Development (3rd ed.) was administered at baseline and post-intervention (January 2021), along with student focus group interviews.

Results: Feasibility results show poor retention at follow-up (15.38%) and limited adherence to the Kick-Smart Homework program, indicating that this program may not be feasible for use in primary schools without additional implementation strategies. Participant focus group interviews provided positive feedback about the program and insights into lack of engagement, including limited family support.

Conclusion: Feasibility was not demonstrated during the implementation of a martial arts inspired home learning program in this primary school setting, with further consideration of the suitability of the content, implementation strategies, and home support required for future program design.

Introduction

Background

A recent Organisation for Economic Co-operation and Development (OECD) publication highlighted that the performance of Australian school students' performance in mathematics has been in decline since 2003 (OECD, 2019). This trend continued between 2012 and 2018, with declines also noteworthy among top-performing students in both mathematics and science (Schleicher, 2019). In 2018, Smith et al. (2018) from the Australian Government's Office of the Chief Scientist suggested that mastery-focused mathematics pedagogy (in contrast to performance-focused) was a key factor in improving Australian children's mathematical abilities, in conjunction with teachers who are genuinely passionate and enthusiastic about the teaching and learning of mathematics. There is a clear need for new strategies to address the enduring decline in student performance in mathematics, especially strategies that influence students' willingness to participate in mathematics and drive teachers' enthusiasm for the teaching of mathematics. Further to this decline in mathematics, Australian students in general currently lack proficiency in Fundamental Movement Skills.

Fundamental Movement Skills (FMS) can be described as the foundation for specialised, sport-specific movement and are commonly categorised into two subgroups: locomotor skills (e.g., running, hopping, jumping etc.) and object-control skills (e.g., throwing and catching) (Goodway et al., 2019). Previous research has shown that FMS competency is more effectively improved through intervention programs than free play and that in general teaching terms, competency can be increased through a game-centred approach that incorporates explicit instruction, effective assessment and quality feedback (Barnett et al., 2016; Logan et al., 2012). It is noteworthy that a systematic review conducted by Tompsett et al. (2017) found that the most successful interventions were taught in conjunction with at-home practice. Further to this, a previous systematic review (See Chapter 3) conducted by the research team highlighted that no previous MA program has included a homework component.

FMS competency has strong positive links to a healthy, active lifestyle in children and adolescents, which has been shown to confer multiple health benefits (e.g., healthy self-concept, reduced sedentary behaviour, high levels of cardiorespiratory fitness, and a healthy weight status) (Veldman et al., 2021). Not only do FMS innately support physical activity (PA) while being performed, but FMS competency provides a solid foundation of skills which an individual can apply in a wide range of sports and PAs (Hulteen et al., 2018). Research evidence has shown that FMS proficiency is also linked to one's future participation in and enjoyment of sport and PA (Behan et al., 2022). Furthermore, current research suggests martial arts participation may positively influence the development of children's motor skills (Li et al., 2022). Despite this knowledge, FMS proficiency among children and adolescents in Australia is very low (Hardy et al., 2017). In fact only 21–40% of the youth population in Australian demonstrate FMS mastery (Active Healthy Kids Australia, 2018).

Similarly, the *2022 Active Healthy Kids Australia Report Card* rates the PA levels of Australian children as a D− (with 'A' being the highest grade) (Active Healthy Kids Australia, 2022), indicating that less than a quarter of all Australian children meet the national guidelines for the recommended daily level of PA of 60 minutes of moderate to vigorous physical activity (MVPA). Children who are inadequately active miss out on the impactful and diverse benefits associated with engagement in regular PA, including lowered risk of non-communicable diseases such as diabetes, stroke and heart disease, reduced symptoms of depression and anxiety, as well as enhanced thinking and learning and overall wellbeing (World Health Organization, 2020). PA interventions have shown success in improving a range of physiological health outcomes in school aged children, such as cardiorespiratory fitness (Braaksma et al., 2018), muscular endurance (Burt et al., 2021) and bone health (Shin et al., 2011); psychological outcomes such as greater self-efficacy (Baiocchi et al., 2017) and reduced aggressive behaviour (reactive and proactive) ($p=<0.001$), delinquent behaviour ($p=0.033$), anxiety/depression ($p=0.001$) and attention problems ($p=<0.001$) (Fung & Lee, 2018); and cognitive outcomes including performance in colour-word test scores (Cho et al., 2017), processing speed (Harwood-Gross et al., 2021) and academic performance (Burt et al., 2021).

The New South Wales Schools Physical Activity and Nutrition Survey (SPANS) (Hardy et al., 2017) reported that in 2015, the median sitting time for children and adolescents aged between 5 and 16 was approximately 53% higher outside of school hours. This is concerning, given that the majority of academic classes in school have children sitting while learning. A PA program that students could take home with them and that supports learning in core subjects such as mathematics has the potential to increase daily levels of PA and improve FMS, and may make the most of a ‘critical window’ of opportunity (Stanley et al., 2013) for after-school PA (3.30 to 6.00pm) and address current trends in sedentary time. This is concurrent with the assertions of a recent systematic review that suggests that active homework has the potential to meet various academic and physical outcomes, but that further strategies and research for student engagement in physical active homework are required (Bailey et al., 2022).

Martial arts is a PA which has also been linked to improvements in academic outcomes such as mathematics performance (Burt et al., 2021), psychological outcomes such as generalised self-efficacy (Baiocchi et al., 2017), and physiological improvements including posture correction (Byun et al., 2014), bone health (Shin et al., 2011) and functional abilities (Cicović et al., 2011). However, to our knowledge, no martial arts interventions have combined martial arts-based PA with the practice of FMS and basic mathematics skills in the form of a homework program for children. The physical aspects of martial arts training lend themselves to be linked to school curriculum outcomes, while the novelty of martial arts-based activities provides a fun and engaging alternative to generic physical activity options.

The socio-ecological model, originally developed and theorised by psychologist Urie Bronfenbrenner (Bronfenbrenner, 1977, 2000) provides a framework that recognises that the individual has a bilateral relationship of influence with a complex range of social and environmental factors. These factors are found in the individual's microsystem (e.g., personal relationships and immediate surroundings), mesosystem (e.g., school, church, neighbourhood), exosystem (e.g., community contexts and social networks), macrosystem (e.g., cultural, societal and religious influences), and lastly the chronosystem (e.g., internal and external elements of policy, history and time) (Kilanowski, 2017). From the practical perspective of an educator, this can be likened to the phrase 'It takes a village to raise a child'. While it is impossible for a teacher to impact each of the student's socio-ecological 'systems', integration of homework may be a way for teachers to impact more than the microsystem of their individual relationship with the child in the school setting. This program aims to incorporate findings from previous research surrounding physical activity-based homework, such as that of Kääpä et al. (2022). An engaging homework program that integrates physical activity and mathematics, and involves working with others (e.g., throwing and catching), has the potential to affect the student's mesosystem by involving family, friends and their neighbourhood. For example, if students live near their classmates in the community, they may be able to participate in, or at least be surrounded by others who are participating in, such a program outside of school hours. This in turn may lead to greater engagement in not only the program, but physical activity and mathematics in general.

Objectives

The primary goal of this study was to determine the feasibility of a novel home learning program focusing on martial arts-inspired exercises and mathematics. Secondary outcomes were also assessed to provide insights regarding the impact of the program on levels of physical fitness, FMS, attitude towards mathematics and executive function in participating children.

Methods

Ethical Approval

This trial was registered with the Australian New Zealand Clinical Trials Registry (ACTRN12621000522819) and approved by the Human Research Ethics Committee of the University of Newcastle, Australia (H-2017-0322) and NSW State Education Research Applications Process (SERAP).

Participants and Setting

The study took place in Term 1, 2021, at a single public primary school in New South Wales, Australia. The school principal was contacted by email and provided with information statements and consent forms for themselves, teachers and student/parents to review before providing consent for their school to be involved in the study. The principal then passed these forms on to the relevant teaching staff to review and provide consent. Participants were eligible for the study if they were currently in Stage 2 of schooling (Grade 3 and 4) and enrolled in a mainstream class in the participant school with no medical condition impacting participation.

Following this, a member of the research team presented an overview the program to each of the three eligible classes and handed out participant information and consent letters for students to take home to discuss with their parents. The students were provided with several reminders from the research team to return their consent form if they were willing to participate.

Participant numbers and randomisation

The planned participant numbers of this trial were based on the collective number of students in the three participating classes at the recruited school. A randomisation envelope was prepared and a blinded independent third party was to allocate the two classes into one of the two groups. Randomisation by class was to be completed following baseline assessments in November 2020, with the three classes allocated into either control. Due to COVID-19 restrictions, the study was put on hold until January 2021. The number of participants in either the control class or the treatment classes was based solely on the number of students who were permanent members of those classes throughout the regular school day. Students were allocated to test or control conditions at an individual level, with names being drawn out of a hat and the first 13 participants being assigned to test conditions, with the remaining 13 participants assigned to control conditions. The randomisation process was organised by a member of the research team writing each participant's name on separate, identical pieces of paper, folding them in half and placing them in the hat. A second, blinded research team member drew the names out one at a time until each student was individually drawn and assigned to test conditions. Participants were not blinded to conditions, nor were assessors.

Kick Smart Homework Program

This pilot randomised control trial integrated mathematics and FMS (in the form of basic martial arts techniques) tasks to be conducted at home. Based on the results of previous trials from authors of this paper (Burt et al., 2021; Riley et al., 2017), who all hold qualifications in primary education, physical education and/or martial arts instruction, this intervention extends those programs outside of school hours, and therefore further examines the potential of martial arts to motivate and engage students both academically and physically. While previous research has shown longer (>15weeks) physical activity-based interventions yield larger effect sizes (ES) (ES=0.76), the literature states interventions shorter than 8 weeks may be feasible, effective and inexpensive alternatives that still deliver moderate to high effect sizes (ES=0.68). The duration of the program was based on this information (Kang et al., 2009). The program required participants to complete 3×10-minute home sessions per week, over a six-week period in Term 1, 2021. The basic martial arts and fitness activities were specifically chosen by the research team, as they are simple body-weight exercises recommended for children. Exercises involved core fitness activities such as squats, star jumps, chair dips, push-ups etc., and variations of such activities, to reflect movements commonly seen in martial arts. The stage-specific mathematics component focussed on procedural fluency, such as skip counting (See Figure 5.1). The control group continued with their regular school homework program, if any was set by the teacher, such as writing out spelling words or completing mathematical equation work sheets.

A) Skip-Counting + Kick-Smart Activity (30 secs)		**B) FMS Activity (30 secs)**
2 x	Double foot rope skip	Underarm throw
4 x	Squat Kicks	Underarm throw
6 x	Hover and punch (alternate arms)	Kick
8 x	Push-ups OR Kneeling push-ups	Kick
10 x	5 m shuttle run	Kick

Figure 5.1. Activity comparison.

Assessments

Primary Outcome – Feasibility

Feasibility was evaluated by examining the following aspects of implementation:

i) Recruitment: This was reported as the number of students who returned a signed participant consent form, as a percentage of the total number of student asked to participate.

ii) Adherence: Students filled in and returned a logbook. This logbook included the instructions for each of the 18 ten-minute sessions, as well as a 'checklist', which acted as a fidelity measure and provided an overview of their feelings towards the program. The overview included the following questions/statements:

- Who participated with me?
- How much did you enjoy your homework today?
- Activities completed (fidelity measure)
- Things I need to keep working on
- Comments and feedback

iii) Retention: Data regarding the number of students who completed the entire program and the number of students who completed both baseline and follow-up assessments.

iv) Program evaluation and satisfaction: As part of the follow-up assessments, the 13 test group participants participated in a single focus group interview asking purpose-designed questions relating to enjoyment and adherence. This assessment was created and implemented for the treatment group as a response to issues arising from students' ability to interpret and respond to a written questionnaire. This was video-recorded and transcribed by a member of the research team. The transcription was then coded and analysed for recurring themes. However, due to this focus group not being included in the original design of the study, little theoretical or practical preparation was able to be put into its development. Results from this focus group have only been included to support other findings.

Secondary Outcomes – Efficacy

The following assessments were conducted at the school at baseline by two members of the research team the week prior to the intervention, and at follow-up (one week after the six-week intervention).

Physical fitness

The following three measures were used to assess physical fitness, using standard testing procedures: 20 m repeated shuttle run test (cardiorespiratory fitness); standing broad jump (explosive leg power) (Henriques-Neto et al., 2020); and 90° push-up test (muscular endurance) (Henriques-Neto et al., 2020).

Measurement of Fundamental Movement Skill (FMS)

Children's FMS competency was assessed using the protocols for locomotor and object-control skills as described in the Test of Gross Motor Development-Third Edition (TGMD-3) (Webster & Ulrich, 2017). This validated assessment was designed to to measure the gross motor functioning in children aged 3–10 via the assessment of 3–5 key skill components for each FMS. Due to time constraints commonly reported as barriers when administering the TGMD-3, a brief version was adopted, as per previous validated research) (Brian et al. 2021; Duncan et al. 2022). After watching a demonstration of each skill, children were individually filmed performing two attempts of the locomotor skills – gallop, hop, skip, and jump – and the object control skills – kick, catch, and underhand throw (TGMD-3) – by assessors blinded to treatment condition. Following this, the performance components of each skill were scored as present ('1') or absent ('0') for both trials by independent coders. Scores for each trial were summed to give total component scores, which were then added to give total skill scores. Aligning with the methods used by Cliff and associates (Cliff et al., 2012), the proportion of children exhibiting mastery were calculated (defined as exhibiting all skill components during both trials, e.g., kick=8/8) and advanced skill proficiency (defined as exhibiting 'all' or 'all but one component' during both trials, e.g., catch ≥5/6) for each skill.

Cognitive Assessment

Executive function: The Trail Making Test (TMT) is a measure of visual attention, speed, scanning, speed of processing and mental flexibility and is a validated cognitive test, commonly used for children (Espy & Cwik, 2004). It involved a two-part visual task (Trail A and B) where participants were required to, first, draw a line from one point to the next as quickly as possible to connect numbers in ascending order (e.g., 1-2-3-4 etc.); and, second, draw a line from one point to the next as quickly as possible to connect both numbers and letters in an ascending and alternating order (e.g., 1-a-2-b-3-c-4-d etc.) The task was timed and errors recorded, with lower scores indicating greater cognitive performance. Aligning with previous studies (Burt et al., 2021; Reitan, 1958), three scores of cognitive flexibility were determined: 1) time to complete 'Trail A' was subtracted from the time to complete 'Trail B' (B-A); 2) time to complete 'Trail B' was divided by the time to complete 'Trail A' (B/A); and 3) time taken to complete 'Trail B'.

Mathematics performance

Student self-efficacy and engagement in mathematics was measured using a modified (stage appropriate) version of the Programme for International Student Assessment (PISA) scales. Note: This assessment was not completed as intended. Further details are provided in 'strengths and limitations' section. Students also completed the four (4) columns (addition, subtraction, multiplication and division) of the One Minute Basic Number Fact Test (OMBNFT). Students were allowed one minute per column, with a short break (20–30 seconds) in between columns.

Statistical analysis

The analyses of efficacy outcomes were performed using IBM SPSS Statistics version 20 and all variables were checked for normality and missing values. Data are presented as mean scores (and standard deviation: SD) for continuous variables. Linear mixed models were used to assess all outcomes for the impact of group (Kick-Smart vs control), time (treated as categorical with levels at baseline and six weeks) and the group-by-time interaction, with these three terms forming the base model. Mixed models are robust to the biases of missing data and provide appropriate balance of Type 1 and Type 2 errors (Mallinckrodt et al., 2004). Mixed model analyses are consistent with the intention-to-treat principle, assuming the data are missing at random (White et al., 2012). Cohen's d was also calculated, and interpreted as follows: d=0.2, 'small' effect size; d=0.5, 'medium' effect size; and d=0.8, 'large' effect size (Vacha-Haase & Thompson, 2004). The qualitative data from the focus group interview was interpreted using thematic analysis.

Results

Feasibility

Recruitment

Four schools in the local area were invited to participate in the study. One school accepted this invitation. Seventy-one students at the recruited school were deemed eligible and invited to participate. Of the total number of students, 26 returned permission slips (recruitment=36.62%). Participants were then split into test (n=13; Male=4, Female=9), or control (n=13; Male=4, Female=9) conditions. The test group consisted of seven Year 3 and six Year 4 students, and the control group consisted of six Year 3 and seven Year 4 students.

The school at which this study was undertaken has a relatively high Family Occupational and Education Index score (>150), according to their publicly available 2021 Annual Report. This score as well as other indicators from this report indicate that the school is located in an area of low socio-economic status (SES). Furthermore, the school report states that 26.15% of Year 3 and Year 5 students achieved in the top 2 bands of The National Assessment Program – Literacy and Numeracy (NAPLAN) Reading, and 11% of Year 3 and 10% of Year 5 students achieved in the top 2 bands of NAPLAN Numeracy. This report has not been referenced, in order to maintain site and participant anonymity.

Adherence

Of the 13 students in the Kick Smart group, only two (15% adherence) returned completed weekly sign-off sheets. Of these two returned documents, neither indicated completion of each session as intended (e.g., missed sessions or did not complete all activities in the session).

Retention

All participants (n=26) completed some baseline assessments. Most participants (n=25) completed some follow-up assessments. One participant was absent for all follow-up assessments. Due to school and class scheduling, baseline and follow-up assessment data was collected over the space of several days (e.g., fitness tests were completed on a separate day to the mathematics assessment). Subsequently, student absence resulted in some students completing some baseline and follow-up assessments and not others.

Program evaluation and Satisfaction: Focus Group Results

Several trends emerged from focus group responses. The first of which being that many students were somewhat unsure of what was expected of them. After being asked 'Did you understand what you were expected to do to complete the program?' three students replied with 'Sort of…' Another trend emerged for the question 'Was it hard to get someone to help you at home?' Five participants raised their hand to indicate that they had trouble with this.

C2: 'My dad was at work, my mum was at work, my sister had a baby to put to sleep.',

C4: '...my dad was always on the couch watching TV, and never does anything with me… and neither do my brothers.'

C7: 'My mum was busy cooking. My dad was busy doing work… and my sister was… just didn't want to help me'

C13: It was hard for me cause mum has to cook dinner, and sometimes she doesn't know how to [inaudible], and, umm, [both brother's names] are useless, 'cause they're stupid… I asked [brother's name] how to do it, but he just hates me… and then dad – by the time he gets home, he just starts watching the news in case COVID got a bit worse or something.

This indicates a trend that many students who did not complete the entire program had a lack of support from their family. This lack of family support is further highlighted by a response to the question 'If you had any questions during the program, what were they?' from another participant who did not complete the entire program:

C5: 'I didn't understand the ten times tables.'

Interviewer: 'The ten times tables? Alright. Did you ask anyone about how to…'

C5: 'Yes, I asked my mum and dad and they said they didn't know, and my little brother was the same [inaudible]. My big sister was just sittin' down watchin' TV. She don't want to help.'

Interviewer: 'Alright, so you asked you family members, but they didn't know their ten times tables, so they couldn't help you?'

C5: [Nods in agreement].

A positive observation was also made in relation to the question 'After completing the Kick-Smart program, do you think you are more active now? What extra physical activity do you do now, if that's the case?' Many participants, even those who did not complete the program in its entirety, suggested that they were more physically active now. Participants provided activities that they were more involved with now, such as 'Play[ing] outside more' and 'running around outside'. One student stated that they now played with their dog more, 'instead of playing [their] Xbox all the time'. One of the participants stated they practise some of the Kick-Smart activities with the 'neighbour who brings their kids over'. A further observation was made in relation to the question 'After completing the Kick-Smart program, how do you feel about completing maths work?' Many of the participants felt 'a lot better' about completing mathematics work.

C9: 'Um, I just…I'm more excited to do it.'

Interviewer: 'More excited?'

C9: 'I used to think I didn't really like it before, but now doing its more fun.'

Interviewer: 'Fantastic. So the Kick-Smart program made maths more fun. Is that right?'

C9: 'Yep!'

Another student stated:

C7: 'It made it easier.'

Interviewer: 'It made it easier? Why did it make it easier?'

C7: 'Because there is a lot of maths things in the thing, so I know more about my times tables.'

Although retention rates were low, most students indicated some level of participation, and commented positively towards the content they had experience with.

Secondary Outcomes (Efficacy)

Physical fitness

For cardiorespiratory fitness, results do not indicate any significant effect (d=−0.19; p=0.999). The explosive leg power measure showed a small but non-significant treatment effect (d=0.26; p=0.567). Muscular endurance showed a large but non-significant treatment effect (d=0.61; p=0.486).

Measurement of Fundamental Movement Skill (FMS)

The following measures showed a small but non-significant treatment effect: TGMD-3 (gallop) (d=−0.30; p=0.865), TGMD-3 (hop) (d=0.40; p=0.803), TGMD-3 (skip) (d=0.26; p=0.929), TGMD-3 (jump) (d=−0.31; p=0.776), TGMD-3 (over-arm throw) (d=−0.20; p=0.404). TGMD-3 (catch) showed a medium but non-significant treatment effect (d=−0.61; p=0.438), as was the same for TGMD-3 (under-arm throw) (d=−0.53; p=0.764). TGMD-3 (kick) showed a large but non-significant treatment effect (d=0.80; p=0.244).

Cognitive Assessment

Trail Making Test-A showed a small but non-significant treatment effect (d=0.30; p=0.858) and Trail Making Test-B showed a medium but non-significant treatment effect (d=0.69; p=0.455).

Mathematics Ability

One section (multiplication) of the One Minute Basic Number Fact Test showed a small but non-significant treatment effect (d=-0.21; p=0.909), while the division section showed a medium but non-significant treatment effect (d=−0.67; p=0.369).

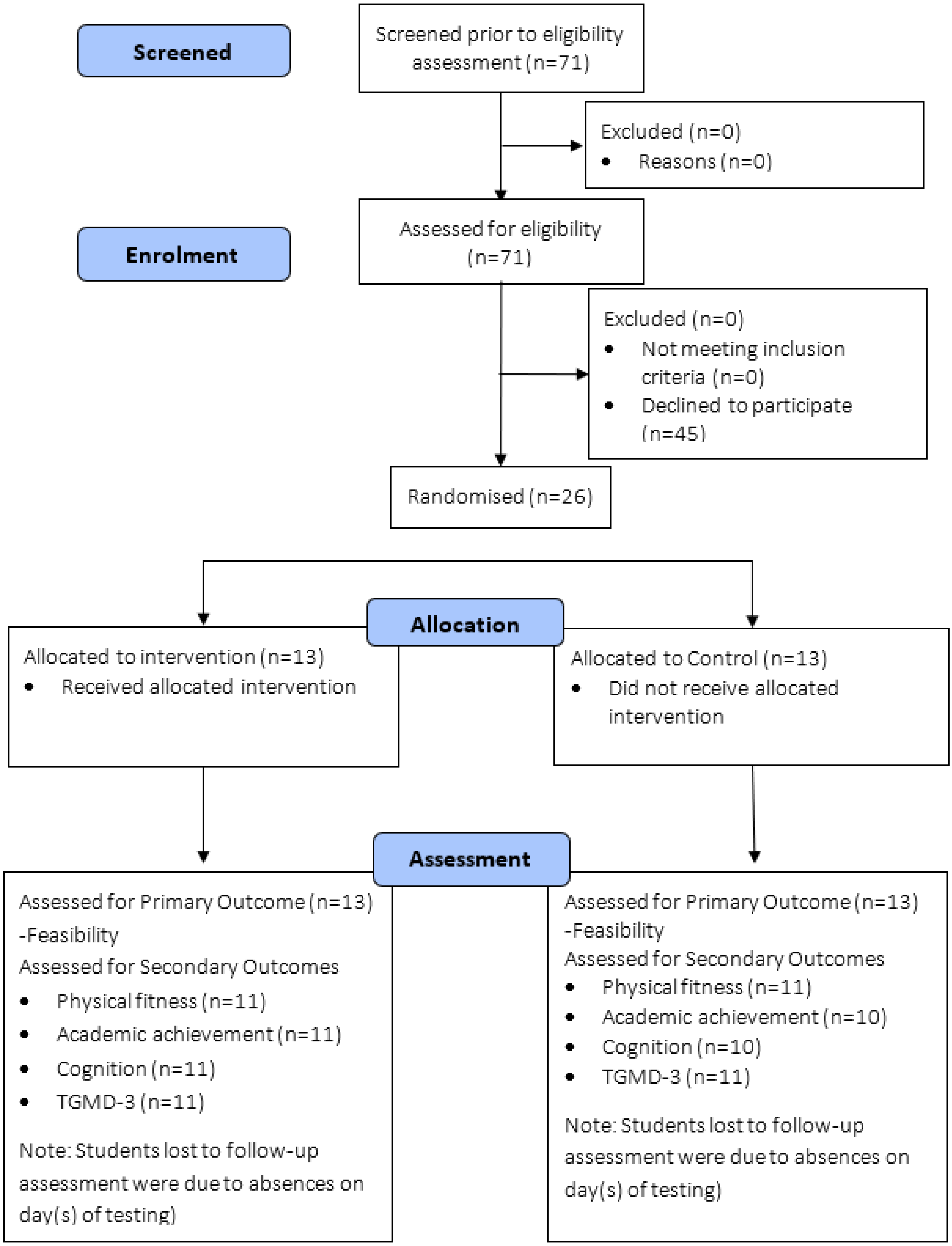

Figure 5.2. Flow of participants through study.

Table 5.1. Participants' scores at baseline and follow-up and ANCOVA results and effect sizes for all measures (Australia, January-March 2021)

Component	Study Group	*N*	Baseline Mean	Baseline SD	Follow-up Mean	Follow-up SD	ANCOVA results (*F*-Value)	*p*-value	Cohen's *d*
Beep Test	Intervention	9	10.636	5.39023	12.2727	6.29430	0.000	0.999	−0.19
	Control	10	9.2000	2.85968	12.0833	6.58453			
90° push-up	Intervention	11	20.2308	11.52645	26.2000	38.46089	0.507	0.486	0.61
	Control	10	16.7000	9.25023	13.9091	7.11975			
Standing broad jump (in cm)	Intervention	11	105.8462	20.24782	118.6364	25.43727	0.342	0.567	0.26
	Control	10	117.7000	25.97456	128.4545	23.47920			
OMBNFT (+)	Intervention	11	15.1538	6.47876	15.8182	6.69056	0.388	0.541	−0.16
	Control	10	18.0000	7.78888	20.0833	8.01655			
OMBNFT (-)	Intervention	11	10.9231	3.37791	10.4545	5.7334	0.145	0.708	−0.12
	Control	10	12.3000	6.97695	11.0833	8.00521			
OMBNFT (x)	Intervention	11	3.6154	3.96943	6.6364	4.69623	0.013	0.909	−0.21
	Control	10	6.8000	5.57375	9.2500	6.32635			
OMBNFT (÷)	Intervention	11	1.9231	2.13937	3.7273	4.02718	0.848	0.369	−0.67
	Control	10	4.4000	3.86437	8.3333	7.37728			
Trail Making Test-A	Intervention	11	39.9869	16.77590	35.8182	8.08531	0.033	0.858	0.30
	Control	10	41.3750	14.29441	38.2000	14.54666			
Trail Making Test-B	Intervention	11	126.8754	58.69896	121.9691	62.60636	0.583	0.455	0.69
	Control	10	149.6270	54.60430	120.1600	71.07464			
TGMD-3 (run)	Intervention	11	8.0000	0.00000	7.5000	0.79772	3.629	0.073	1.10
	Control	11	7.9091	0.30151	6.6364	1.50151			
TGMD-3 (gallop)	Intervention	11	7.0000	1.34840	7.4167	0.90034	0.030	0.865	−0.30
	Control	11	7.0000	0.89443	7.4545	1.03573			
TGMD-3 (hop)	Intervention	11	5.5000	2.46798	6.5000	1.31426	0.064	0.803	0.40
	Control	11	6.4545	1.36848	6.7273	1.10371			
TGMD-3 (skip)	Intervention	11	4.3333	1.55700	4.5833	1.44338	0.008	0.929	0.26
	Control	11	4.3636	0.80904	4.7273	.90453			
TGMD-3 (jump)	Intervention	11	7.1667	2.03753	7.1667	1.11464	0.084	0.776	−0.31
	Control	11	7.0000	1.84391	7.3636	.80904			
TGMD-3 (catch)	Intervention	11	4.5833	1.31137	5.1667	0.83485	0.630	0.438	−0.61
	Control	11	4.9091	1.51357	5.5455	1.03573			

Component	Study Group	N	Baseline Mean	Baseline SD	Follow-up Mean	Follow-up SD	ANCOVA results (F-Value)	p-value	Cohen's d
TGMD-3 (kick)	Intervention	11	6.1667	1.74946	6.9167	0.90034	1.451	0.244	0.80
	Control	11	5.9091	2.25630	6.4545	1.69491			
TGMD-3 (over-arm throw)	Intervention	11	5.5000	1.73205	6.4167	1.78164	0.731	0.404	−0.20
	Control	11	5.1818	1.77866	6.8182	1.32802			
TGMD-3 (under-arm throw)	Intervention	11	6.2500	1.35680	6.2500	1.95982	0.093	0.764	−0.53
	Control	11	5.9091	1.51357	6.3636	1.68954			

Discussion

The aim of this feasibility study was to develop, implement and evaluate a martial arts-based homework program that focused on developing mathematics and FMS in school-aged children. It was hoped the novelty of martial arts training would influence student engagement in the program. While enthusiasm was shown towards the program and all of its components by all participants at the outset, retention and adherence rates diminished irrespective of initial participant interest. Due to the inherent danger of practising martial arts unsupervised, the content of the program was significantly modified to incorporate safe martial arts-'inspired' movements rather than martial arts techniques that the students may have been expecting to practise, based on their prior knowledge of martial arts from various influences such as comics, television and so forth. The following sections discuss the feasibility, efficacy, strengths, limitations and future directions for this study.

Feasibility

Recruitment, retention and adherence levels showed that this program may not be feasible for use in a primary school setting. Feedback received during the focus group interview with test group participants provided some insight into reasons behind these results. The majority of students commented that the sections of the program that they did interact with were enjoyable. One student noted that it gave them 'something [to do] besides X-Box' while another stated it was 'easier' than other homework 'because [they] didn't have to write'. Other reasons for enjoyment included the use of soccer balls, and the novelty of incorporating movement into mathematics. This is consistent with the results of other studies such as the work of Riley et al. (2017), whose participants also stated that they enjoyed being 'free' and 'outdoors', and that the combination of 'being active' and doing mathematics 'makes it more fun' (Riley et al., 2017). Students also commented on their low adherence, and that a lack of family support or involvement was a common factor. This is consistent with the findings of Eather et al. (2013), whose physical fitness intervention also noted low adherence to the home-based component of their program, and that many students were not supported in the home environment while completing tasks. Additionally, the program did not align with the homework policy (or lack thereof) of the school. While the content was directly linked to age-appropriate curriculum outcomes relevant to the participants, the absence of a clear homework policy (that is upheld across the school) may have impacted the retention and adherence rates.

Preliminary Efficacy

While the majority of students completed baseline and follow-up assessments, findings should be interpreted with caution due to the very low adherence rate to the Kick-Smart homework program, and small sample sizes. Low adherence may be attributed to various factors including family–teacher communication, video game use and other family influences. For instance, Kraft and Dougherty (2013) found that family–teacher communication increased the likelihood of students completing homework by 40%. The research team had no contact with families after participant information statements were handed out, which may have been a contributing factor. One topic raised by students in the focus group was the use of video games. The work of DeVito (2016) states that boys who spent great amount of time playing video games devote less attention to homework, as do students whose parents reported to being less engaged in their child's academic pursuits. Similarly, students with a lack of role model at home are more likely to spend more time taking care of younger siblings and other home responsibilities (DeVito, 2016). These points or similar were also raised by respondents during the focus group. A full transcript of this focus group is available upon request. Further to adherence, the New South Wales Department of Education's policy for homework in public schools indicates that homework in primary school is not mandatory, but students *may* be set various simple tasks such as reading and writing, or completing some mathematical activities they have learnt at school (Department of Education and Communities, 2022). The policy does, however, state that each school is to develop a homework policy which is relevant to student needs, developed in consultation with community stakeholders, and communicated to staff students and carers. The school in which this trial was run could not provide a formal homework policy upon request, which may support an inconsistent approach to homework among classes. It could be argued that the students were therefore not familiar with completing homework, particularly the notion of returning the completed work.

Strengths, Limitations and Recommendations

A strength of this study is that it was implemented at a school in an area with low socioeconomic status, where students often need access to and benefit from novel and effective learning programs compared to students from schools within middle to higher income areas (Holsen et al., 2009; Kim & Quinn, 2013). As can be seen in the school report outlined previously, demographic information makes this school somewhat of a priority school to implement such programs.

Recruitment for the study was difficult, with only a single school accepting the invitation to participate in the study. This may have been due to time constraints faced by these schools, or a misinformed hesitance to engage in a martial arts-based program. Thus, rather than being grouped by class, the number of participants in each group was an even split of the total number of eligible students able to be recruited prior to commencement of baseline assessments. Further to this, the limited number of participants resulted in a lack of any generalisations being able to be made.

Due to the change of approach to the questionnaire and the resulting focus group interview, the analytical approach to the focus group lacked some depth. While the focus group followed a series of pre-written questions based on the original questionnaire, there was no pre-determined theoretical framework for the qualitative data and thus the analysis lacked some structure in relation to official coding of responses. Additionally, the feasibility framework that shaped the feasibility results relied partly on participants' accurate completion of the booklet that tracked their adherence. While this was explained to participants during the introduction to the program, participants failed to complete these accurately or completely.

Future recommendations

With such poor adherence, it is recommended that any future studies of this nature incorporate an implementation framework such as the PRACTIS guide (Koorts et al., 2018). This guide suggests that the success of physical activity interventions may be improved through

> two principles: 1) differences between the research and practice context can be addressed during intervention development and implementation planning by focusing on system, delivery personnel, and intervention characteristics; and (ii) early planning for implementation barriers and facilitators can improve subsequent translation into practice. (Koorts et al., 2018)

These two principles can be applied to by future studies planning for barriers such as lower support from the home, through various changes such as a video component to guide participants through activities, or an online chat group to address questions and problems that they are facing. This aligns with the socio-ecological model by targeting the home as well as the school environment. If resources are made available to students and their families to access at home, this engages with a greater breadth of influential factors in the learners' contexts, which is important for behavioural change in both mathematics and physical activity. Furthermore, the program content should be tailored to suit the school in which it is going to be implemented, rather than programmed at a standardised level of mathematical competency.

A further suggestion is that it needs to be determined whether the program can be successfully implemented in schools in similar locations and with similar homework policies – or lack thereof – on a larger scale rather than a small sample from a single setting.

Conclusion

Adherence levels results limit the ability to evaluate program efficacy. Feasibility measures indicate that a martial arts and mathematics homework program may not be feasible. While some small, medium and large effect sizes were found in Physical Fitness, FMS, Cognition, and Mathematics Ability, these were all shown to be statistically non-significant. A larger sample is recommended to investigate a true level of feasibility and efficacy of the program. Advisory groups should be used to tailor the program to suit the needs of individual schools and student cohorts if further implementation is to occur.

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Chapter 6. Study 4 – The Kick-Smart Questionnaire Project

6.1. Introduction to the study

The results from the previous three studies indicate that martial arts may be a valuable addition to western schooling systems. There is a need to gain an understanding of teachers' beliefs and views relating to martial arts, particularly in school settings, and the benefits it may provide to students, to enable any barriers and challenges to implementation in this setting to be addressed. The following study aimed to understand the views and beliefs of primary school teachers and High School PDHPE teachers in NSW, Australia. A cross-sectional, online, study-specific survey developed by the research team was distributed through several mediums outlined in the following section. The results indicate most responses are quite positively skewed towards martial arts being introduced into school systems and show that many respondents see the value that martial arts training can provide to school-aged children.

Burt, L. D., Riley, N., & Eather, N. (Submitted 24 November 2022). Current and pre-service teachers' views and beliefs regarding martial arts and the inclusion of martial arts in Australian school settings. *Health Science Reports* (Under review).

6.2. Statement of contribution of others

By signing below I confirm that Mr Louis Burt contributed substantially in terms of study concept and design, data collection and analysis, and preparation of the paper/publication entitled to the paper/publication entitled *Current and pre-service teachers' views and beliefs regarding martial arts and the inclusion of martial arts in Australian school settings.*

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6.3. Current and pre-service teachers' views and beliefs regarding martial arts and the inclusion of martial arts in Australian school settings

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Abstract

Purpose: This study investigates views and beliefs of current and pre-service teachers regarding martial arts (MA) and the inclusion of martial arts in schools.

Method: Participants completed an anonymous, 28-item questionnaire made available online via Qualtrics (August–November 2020). Data was analysed using SPSS software to compare mean scores by sex, and between qualified teachers and pre-service teachers. Qualitative data in the form of quotes was drawn upon and used to complement the quantitative results.

Results: Results indicate teachers and pre-service teachers view MA as a worthwhile and beneficial activity for school-aged students, and support the inclusion of MA into school settings

Conclusion: These findings may be useful to inform policy and practice in schools, and the development of teacher education programs, professional development courses, and school-based education programs utilising MA to meet physical education learning outcomes.

Key words: combat sport, pre-service teachers, questionnaire, curriculum, wellbeing

Introduction

'Martial arts' (MA) is a collective term that encompasses the multitude of combat sports, self-defence and hand-to-hand combat systems developed and implemented around the world (Rousseau, 2019). Studies of MA participation have identified a wide range of benefits to school-aged children. Physiological improvements include increased oxytocin levels (Rassovsky et al., 2019) and improved increased flexibility, muscular fitness and balance (Padulo et al., 2014; Vando et al., 2013). Additionally, emerging evidence indicates that MA may facilitate positive change in psychological (Baiocchi et al., 2017), cognitive (Cho et al., 2017) and academic outcomes (Burt et al., 2021). Internationally, education systems recognise the benefits of MA, with countries such as the USA having school wrestling teams and associated scholarships, while Budo (an umbrella term for traditionalist Japanese MA) is a mandatory element of junior high-school physical education in Japan (Chambers et al., 2020).

Despite evidence of the positive benefits, some researchers warn against increased aggression levels and antisocial behaviour among participants (when fighting techniques are the sole focus, rather than a holistic approach – see Nosanchuk and MacNeil (1989)) (Vertonghen & Theeboom, 2010). Furthermore, fighting skills and violence are often glorified and propagated in movies, television shows and other popular culture (Lu, 2008b), creating some unrealistic and/or untrue perceptions of MA as a whole. Thus, the incorporation of MA into school settings remains a challenge, partially due to school administrators' and teachers' safety concerns, their perceptions of MA, and/or a lack of teacher training to deliver MA in an effective manner that meets curriculum objectives (Akehurst, Southcott, & Lambert, 2020).

Within Australia, the New South Wales (NSW), Australian Capital Territory (ACT), South Australia (SA) and Victoria (VIC) Department(s) of Education each currently provide specific safety guidelines and procedures for the teaching of MA within school contexts (NSW Government, N.D.). The guidelines suggest that MA is acceptable for implementation in both primary and secondary schools (assuming the safety guidelines are followed), but it is unclear whether teachers in these states are aware of these guidelines, and data confirming if and when MA is used in schools does not exist.

Furthermore, numerous outcomes in both the current Australian Health and Physical Education curriculum and the NSW Personal Development, Health and Physical Education curriculum lend themselves to MA (Australian Curriculum, 2015; NSW Education Standards Authority, 2018). For example, traditional MA often incorporate ethical and social education, through methods such as meditation and philosophy, discussion, and consistent etiquette expectations (bowing to each other, showing respect to higher level students and instructors, and respecting equipment) in addition to physical training (Nosanchuk & MacNeil, 1989). A number of outcomes from the aforementioned syllabi, associated with physical activity, align with the foundations on which MA builds on, such as 'adapting movement skills in a variety of contexts' (NSW Education Standards Authority, 2018). For example, in grappling and wrestling, one must constantly 'adapt movements and techniques' so as not to be predictable and easy to counter. A student of MA must also 'propose, apply, and assesses solutions to movement challenges' (NSW Education Standards Authority, 2018). For example: in competition or practice, if a certain technique is not effective on one's opponent/training partner, one must quickly think of a solution or new technique to perform that will allow for a solution. In relation to movement patterns, a MA student may 'create, perform and analyse' their own *kata* (sequence of movements, similar to a dance routine) (NSW Education Standards Authority, 2006).

Since mathematical literacy was first assessed as a major domain in 2003, Australia's average score for mathematical literacy has declined by 33 points (equivalent to more than one year of schooling) (Thomson et al., 2019). Australia is also under-performing in relation to physical activity, ranking at a tied 32nd place out of 49 countries for its 'Overall Physical

Activity' grade (Active Healthy Kids Australia, 2018). A systematic review by Watson et al. (2017) concludes that classroom-based physical activity interventions may offer practical, cost-effective strategies to increase physical activity levels as well as academic-related outcomes, particularly for improving on-task behaviour, and consequentially reducing off-task classroom behaviour and selective attention (Watson et al., 2017). The novel work of Nicholas Riley and colleagues (2016) investigates this claim, finding that embedding movement-based learning in mathematics lessons had a significant positive effect on children's engagement and enjoyment, without conceding the quality of learning (Riley et al., 2017). A more recent study conducted by Burt et al. (2021) finds that a school-based martial arts program that embedded mathematics concepts into martial arts lessons had significant positive effects on physical and academic outcomes. Additionally, feasibility assessments in this study returned highly positive results from both student participants and their class teachers relating to perceived benefits and enjoyment (Burt et al., 2021). Due to an increasingly defined curriculum and increased accountability for teachers, current teachers are experiencing the overcrowding of Australian school curriculums (Comber, Woods & Grant, 2017). This presents a need for innovative ways to help teachers meet demands in a way that is physically and cognitively engaging for children. The unique and diverse characteristics of MA may present teachers with the ability to integrate MA into physical education, mathematics or literacy programs while increasing activity levels of Australian school-aged children, whose activity remains lower than the recommended levels.

In summary, active participation in MA has been shown to provide a wide range of benefits to school-aged children, including psychological (Baiocchi et al., 2017), cognitive (Cho et al., 2017) and academic outcomes (Burt et al., 2021), but remains a non-existent or fringe activity in many schools around Australia. This brings to the fore a need to investigate the views and beliefs of current and pre-service teachers regarding MA and the inclusion of MA in school settings.

Materials and Methods

Survey

The research team consisting of four qualified teachers (two of whom are highly experienced MA instructors and two highly experienced PDHPE teachers), developed a purpose-designed questionnaire (for access to full questionnaire, email lead author) to target the study aims. After both university and NSW State Education Research Applications Process (SERAP) ethics approval was granted, the survey was then transferred online to Qualtrics and made available for participants between the August 26 and November 23, 2020. The survey consisted of 9 demographic questions presented in a multiple-choice format, and 19 topic-specific questions presented in a 5-point Likert scale format, and two open-ended questions. The survey was separated into the following nine sections:

1. List of definitions
2. Demographic information
    a. General demographic information (gender; age; school type; MA experience; current year of undergraduate study [if applicable], area of education studied [or studying])
    b. Qualified (and practising) teachers (section only accessible to these participants) (e.g., years teaching experience; public or private school; time allocated to practical PE in their classroom each week; time allocated to sport in their classroom each week).
3. School climate (this was only accessible to qualified practising teachers) (3 questions, e.g. *To what extent do you believe that behavioural issues (e.g., bullying, violence, disrespect, vandalism) is an issue in your school?*)

4. Beliefs (12 questions, e.g. *I believe the NSW K-10 PDHPE Syllabus lends itself to the incorporation of martial arts.*)
5. Perceived benefits for your students (10 questions, e.g., *Martial arts training can help increase energy levels in children and adolescents*)
6. Enjoyment (3 questions, e.g. *I believe children and/or adolescents in the class(es) I teach would enjoy participating in martial arts training*)
7. Future plans (6 questions, e.g. *In the future, I would be interested in learning how to incorporate martial arts in a classroom setting*)
8. Martial arts topics most beneficial for school students (11 topics, e.g., *Learning how to punch*)
9. Concerns and suggestions (Qualitative).

Recruitment and participants

Invitations were sent to principals of independent and public schools (n = 22) in the Greater Hunter region (NSW, Australia). The questionnaire was also shared to the online student learning platform for 16 undergraduate physical education teaching courses for the programs: Bachelor of Education (Secondary) (PDHPE); Bachelor of Education (Early Childhood and Primary); Bachelor of Education (Primary), at the University of Newcastle, Australia. The questionnaire was also advertised on six Facebook sites designed for Australian teachers, and undergraduate teachers to network and communicate (after consent was received from the page administrators). Additionally, each member of the research team posted the questionnaire on their personal social media pages (e.g., Twitter, Facebook)

Consent

All participants needed to provide informed consent to complete the questionnaire.

Analysis

Quantitative data was analysed using IBM SPSS Statistics version 22 (IBM Corp) and descriptive statistics were explored (means [M], standard deviations [SD]). One-way ANOVA was used to determine if differences between study outcomes existed between demographic groups. Qualitative data in the form of quotes was drawn upon used to complement the quantitative results.

Results

Descriptive Statistics

The descriptive statistics are summarised in Table 6.1. A total of 97 current (37.1%; n = 36) and preservice teachers (62.9%; n = 61) completed the survey between the dates of August 26 and November 23, 2020; 63.9% (n = 62) female, 34% (n = 33) male. The most common age group was 18- to 24-year-old, representing 62.9% (n = 61) of participants. The most represented teacher or undergraduate studying to become such, in this study sample was PDHPE Teachers (38%; n = 35). Most participants 66% (n = 64) indicated that they had never participated in any form of MA, and only 3.1% (n = 3) indicated that they had consistently participated in MA for 5+ years. When asked if they considered themselves to be physically fit, the majority of participants answered either ‘somewhat agree’ (45.4%; n = 44), or ‘strongly agree’ (23.7%; n = 23).

Qualified (and practising) teachers

Survey participants were predominantly from public schools, representing 75% of the sample – indicative of the larger proportion of teachers in the government sector, compared to independent and Catholic schools – and teachers of Stage 3 (n = 20/36). On average, teaching experience was 3.63 years (SD = 2.27; n = 16), with only three participants stating that they had been working for 6–10 years, or longer than 10 years.

School climate

Of the 28 practising teachers who completed this section, 60.7% either ‘somewhat agree[d]’ (21.4%; n = 6), or ‘strongly agree[d]’ (39.3%; n = 11) that behavioural issues (e.g., bullying, violence, disrespect, vandalism) [are] an issue in [their] school. From the same 28 teachers, 82% either ‘somewhat agree[d]’ (42.9%; n = 12), or ‘strongly agree [d]’ (39.3%; n = 11) that these behavioural issues impact negatively on learning in the classroom. Additionally, teachers were given a list of potential barriers for teaching martial arts in [their] school and asked to rate each of them on a 5-point Likert scale as being, or not being a barrier. These barriers were ranked as shown in Table 6.1.

Beliefs and attitudes towards martial arts; perceived benefits of martial arts training; future plans; most beneficial martial arts topics, as perceived by participants

Results from practising teachers and preservice teachers indicate a low perception of Government recognition of MA in NSW schools, with mean a participant score of 2.94 out of 5 (N = 88; SD = 0.864) for item Q17.6 (see Table 2). Most participants reported that MA training can provide a wide range of benefits to their students, including improved muscular fitness (mean = 4.34; N = 86; SD = 0.713), improved aerobic fitness (mean = 4.22; N = 86; SD = 0.773), and improved mental health (mean = 4.20; N = 86; SD = 0.733). The vast majority of participants ‘would support the inclusion of MA into the curriculum’ (mean = 4.26; N = 88; SD = 0.864). Most participants 66% (n = 64) have never participated in any form of MA training, and would not feel comfortable teaching this (mean = 3.15; N = 89; SD = 1.284).

Table 6.1. Teachers' rankings of barriers for teaching martial arts their schools

Rank	Field	Mean	Std Deviation
1	Teachers' lack of knowledge/skills in teaching martial arts	4.46	1.05
2	Not enough training opportunities for teachers	4.11	1.08
3	Lack of interest/willingness of teachers to teach martial arts	3.82	1.26
4	No time in teachers schedule to explore opportunities for teaching new types of physical education	3.79	1.11
5	Insufficient equipment for students to use	3.68	1.26
6	Insufficient equipment for teachers to use	3.68	1.31
7	Not enough variety of equipment	3.57	1.27
8	Teachers' lack of knowledge/skills in teaching physical education	3.54	1.40
9	Damaged and/or poor-quality equipment	3.36	1.23
10	Out-dated equipment	3.36	1.23
11	Problems scheduling time in appropriate school areas (e.g. basketball court, fields, etc) for each class.	3.11	1.35

Question: Do you consider any of the following a barrier for teaching martial arts in your school
1=strongly disagree (is not a barrier); 2=disagree; 3=Unsure; 4=somewhat agree; 5=strongly agree (is a barrier)

Many participants, however, indicated they would enjoy teaching the subject matter to their students (mean = 3.76, N = 86; SD = 1.073), and would be interested in learning how to incorporate martial arts into a classroom setting (mean = 4.04; N = 85; SD = 0.096), and would be interested in attending professional development/accreditation to learn how to teach basic martial arts techniques to [their] students (mean = 3.92; N = 85; SD = 1.003).

Comparison of means – teachers and pre-service teachers

Beliefs

As shown in Table 6.3, there were only two questions with statistically significant differences between groups. The first being Q17.6: *I believe the NSW Department of Education promotes martial arts as an acceptable in-school sport* ($p = 0.000$). This was the lowest mean score for both groups. Preservice teacher participants rated higher on this question (Teachers = 2.33; Preservice teachers = 3.21), indicating they were more likely to have a higher perception of Government recognition of MA in NSW schools. The second statistically significant difference was seen in Q17.9: *If self defence, or a martial art (of any kind) was introduced to the curriculum, I would support this* ($p = 0.031$). Both groups, however, scored this section highly to very highly, having both groups rating >4.2 out of 5. This had the highest mean score for both groups.

Perceived benefits of martial arts training

Two statistically significant differences were found in his section. The first can be seen in Q18.3: *Martial arts training can improve muscular fitness in children and adolescents* ($p = 0.039$). While this was the highest mean score for both groups in this section, (score ≥4.2 out of 5), practising teachers rated this higher (score = 4.58) than preservice teachers (score = 4.23).

Table 6.2 Comparison of means - Teachers and Pre-service teachers

Beliefs

Question	Field	Teacher (n=27)			Pre-service teacher (n=61)			Total (n=88)			
		Mean	**N**	**SD**	**Mean**	**N**	**SD**	**Mean**	**N**	**SD**	**Sig.**
Q17.1:	I believe martial arts training has a place in a primary school setting	3.89	27	1.05	3.62	61	0.80	3.70	88	0.89	.196
Q17.2	I believe martial arts training has a place in a high school setting	4.00	27	0.96	3.87	61	0.81	3.91	88	0.85	.509
Q17.3	I think all primary school-aged students should have the opportunity to try martial arts training	4.11	27	0.97	4.00	61	0.75	4.03	88	0.82	.562
Q17.4	I think all high school-aged students should have the opportunity to try martial arts training	4.30	27	0.91	4.18	61	0.56	4.22	88	0.69	.468
Q17.5	I believe the NSW K-10 PDHPE syllabus lends itself to the incorporation of martial arts	3.41	27	1.05	3.46	61	0.96	3.44	88	0.98	.821
Q17.6	I believe the NSW Department of Education promotes martial arts as an acceptable in-school sport	2.33	27	1.11	3.21	61	0.88	2.94	88	1.03	.000
Q17.7	Incorporating physical activity of any kind into the instruction of Key Learning Areas (KLA's) such as Mathematics or English could be beneficial for students	4.33	27	0.92	4.11	61	0.88	4.18	88	0.89	.291
Q17.8	Incorporating martial arts training into the instruction of KLA's such as Mathematics or English could be beneficial for students	3.89	27	1.01	3.62	61	1.04	3.70	88	1.03	.266
Q17.9	If self-defence, or a martial art (of any kind) was introduced to the curriculum, I would support this.	4.33	27	1.04	4.23	61	0.78	4.26	88	0.86	.606
Q17.10	If self-defence, or a martial art of any kind was introduced to the curriculum, I would be confident teaching this	2.71	28	1.49	3.34	61	1.14	3.15	89	1.28	.031
Q17.11	A school-based martial arts program that addresses PDHPE syllabus outcomes is appealing	4.07	28	1.18	3.92	61	0.82	3.97	89	0.95	.481
Q17.12	A school-based martial arts program that addresses other KLA syllabus outcomes is appealing	4.07	28	1.12	3.87	61	0.81	3.93	89	0.92	.335

Perceived benefits of martial arts training (Each statement began with '*Martial arts training can…*')

Question	Field	Teacher			Pre-service teacher			Total			
		Mean	**N**	**SD**	**Mean**	**N**	**SD**	**Mean**	**N**	**SD**	**Sig.**
Q18.1	...help increase energy levels in children and adolescents	4.31	26	1.09	4.10	60	0.60	4.16	86	0.78	.259

Q18.2	...improve aerobic fitness in children and adolescents	4.27	26	1.15	4.20	60	0.55	4.22	86	0.77	.705
Q18.3	...improve muscular fitness in children and adolescents	4.58	26	0.90	4.23	60	0.59	4.34	86	0.71	.039
Q19.1	...improve mental health in children and adolescents	4.46	26	0.91	4.08	60	0.62	4.20	86	0.73	.027
Q19.2	...improve motivation to exercise in children and adolescents	4.27	26	1.00	4.12	60	0.69	4.16	86	0.80	.417
Q19.3	...help children and adolescents feel like they can persevere and accomplish more	4.42	26	0.90	4.12	60	0.69	4.21	86	0.77	.090
Q19.4	...help children and adolescents feel more motivated at school	4.23	26	0.95	3.95	60	0.81	4.03	86	0.86	.166
Q19.5	...help children and adolescents feel more motivated at school	4.19	26	0.69	3.97	60	0.76	4.03	86	0.74	.197
Q19.6	...help children and adolescents get along better with other people in their life (e.g., family, class mates, friends)	4.12	26	0.77	3.78	60	0.83	3.88	86	0.82	.084
Q19.7	...address violent / anti-social behaviour in schools	4.04	26	0.66	3.92	60	0.89	3.95	86	0.83	.533

Attitudes towards teaching martial arts

Question	Field	Teacher			Pre-service teacher			Total			
		Mean	N	SD	Mean	N	SD	Mean	N	SD	Sig.
20.1	I believe children and/or adolescents in the class(es) I teach would enjoy participating in martial arts training	4.04	26	0.96	4.02	60	0.73	4.02	86	0.80	.908
20.2	I believe children and adolescents in general would enjoy participating in martial arts training	4.19	26	0.90	4.1	60	0.71	4.13	86	0.76	.610
20.3	I would enjoy teaching martial arts to students	3.46	26	1.36	3.88	60	0.90	3.76	86	1.07	.094

Future plans

Question	Field	Teacher			Pre-service teacher			Total			
		Mean	N	SD	Mean	N	SD	Mean	N	SD	Sig.
Q22.1	In the future, I would be interested in learning how to incorporate martial arts in a classroom setting	4.12	26	1.03	4.00	59	0.85	4.04	85	0.91	.591
Q22.2	I would be interested in attending professional development / accreditation to learn how to teach basic martial arts techniques to my students	3.92	26	1.32	3.92	59	0.84	3.92	85	1.00	.974
Q22.3	In the future, I would be interested in a martial arts-based program that also improved NSW KLA syllabus outcomes	4.27	26	0.96	3.78	59	0.77	3.93	85	0.86	0.014

Q22.4	If martial arts were introduced into the NSW curriculum, I would outsource the instruction, rather than teach it myself	3.65	26	1.09	3.63	59	0.89	3.64	85	0.95	.906
Q22.5	In the future I would be comfortable incorporating martial arts in my own classroom	3.58	26	1.14	3.66	59	0.86	3.64	85	0.95	.709
Q22.6	In the future I plan on participating / training (or continuing) in some form of martial art (e.g., Boxing, Kickboxing, Wrestling, Jujitsu, Karate, Taekwon-Do etc)	3.12	26	1.48	3.39	59	1.13	3.31	85	1.24	.352

Most beneficial martial arts topics for children and adolescents

Question	Field	Teacher			Pre-service teacher			Total			
		Mean	N	SD	Mean	N	SD	Mean	N	SD	Sig.
Q23.1	Movement / Parkour type activities (e.g., rolling, jumping, vaulting, falling safely)	4.60	25	0.58	4.05	59	0.66	4.21	84	0.68	0.000
Q23.2	Learning how to dodge and block attacks	4.36	25	0.64	4.24	59	0.65	4.27	84	0.65	.430
Q23.3	Learning how to punch	3.68	25	1.11	3.75	59	1.08	3.73	84	1.08	.800
Q23.4	Learning how to kick	3.76	25	1.13	3.73	59	1.03	3.74	84	1.05	.902
Q23.5	Grappling / Wrestling (e.g., how to safely escape if tackled or grabbed)	4.20	25	0.91	3.98	59	0.90	4.05	84	0.90	.317
Q23.6	Teamwork / team building activities among classmates	4.72	25	0.54	4.44	59	0.68	4.52	84	0.65	.071
Q23.7	Wellbeing / ethical discussions at the end of each session, focussing on topics such as respect, integrity, self-control etc.	4.68	25	0.63	4.42	59	0.62	4.50	84	0.63	.089
Q23.8	Olympic martial arts: Judo, Taekwon-Do & Karate	3.92	25	1.00	3.75	59	1.06	3.80	84	1.04	.485
Q23.9	Learning katas / forms / poomsae (set movement routines)	3.84	25	1.11	3.64	59	1.05	3.70	84	1.06	.443
Q23.10	Meditation / mindfulness	4.48	25	1.01	4.32	59	0.84	4.37	84	0.89	.460
Q23.11	Learning how to use various traditional weapons (e.g., swords, Bo staff, Kali sticks)	2.88	25	1.48	3.10	59	1.26	3.04	84	1.32	.485

N=Number of responses; SD=Standard Deviation; Sig.=Significance

The second significant difference was found in question 19.1: *Martial arts training can improve mental health in children and adolescents* ($p = 0.027$). Again, both rated this section highly (score ≥4 out of 5), and following this trend, teachers rated this question higher (score = 4.46) than preservice teachers (score = 4.08). Although not statistically significant in most areas, the mean score for the practising teacher group was higher in all 10 questions in this section, indicating that they may place more value on MA and the benefits they believe it can provide children and adolescents than preservice teachers do. The attribute with the lowest perceived benefit was not the same for both groups. The lowest mean score for teachers was found in Q19.7: *Martial arts training can … address violent/antisocial behaviour in schools* (mean = 4.04). The lowest mean score in this section for preservice teacher was found in Q19.6: *Martial arts training can … help children and adolescents get along better with other people in their life* (e.g., family, classmates, friends) (mean = 3.78).

Attitudes towards teaching martial arts

There were no significant differences between groups in this section. The scores were quite similar in all questions. All participants agreed that: the students they teach would enjoy participating in MA (scores ≥4 out of 5); that children and adolescents in general would enjoy participating in MA (scores ≥ 4 out of 5). Q20.3 was the question with the lowest mean in this section for both groups, however, both groups still indicated they would enjoy teaching MA to students (scores ≥ 3.4 out of 5).

Future plans

A statistically significant difference was seen in Q22.3: *In the future, I would be interested in a martial arts-based program that also improved NSW KLA syllabus outcomes* ($p = 0.014$). In the top three mean scores given by both groups, two intergroup commonalities were identified. Both groups had Q22.2 and Q22.3 in their top three highest mean scores (scores ≥ 3.77 out of

5), indicating a general interest in attending professional learning for MA teaching among both groups.

Most beneficial martial arts topics

A statistically significant difference between both preservice and practising teacher participants was found in ‘movement/ parkour type activities (e.g., rolling, jumping, vaulting, falling safely)’ (p = 0.000). Both groups' five highest-rated topics were the same. Teamwork/team building activities among classmates and wellbeing/ethical discussions at the end of each session, focussing on topics such as respect, integrity, self-control etc. being the top two subjects (respectively) for both groups. Meditation/mindfulness, movement/parkour type activities (e.g., rolling, jumping, vaulting, falling safely), and learning how to dodge and block attacks were also found in the top five in both groups, but varied slightly in rankings. Both groups ranked learning how to use various traditional weapons (e.g., swords, bo staff, kali sticks) the lowest (Teachers = 2.88; Preservice teachers = 3.10).

Comparison of means – sex

Beliefs

Table 6.3 shows a statistically significant difference between male and female participants' beliefs relating to inclusion of MA training in primary school settings. While both males and females had a positive skew toward martial arts (scores ≥ 3.58 out of 5), males rated this question higher (F = 3.59, M = 4.00; p = 0.017). There was a generally high mean score in favour of providing students in both primary (female = 4.04; male = 4.17) and high-school (female = 4.16; male = 4.33) settings with the opportunity to try MA training. The lowest total mean was found in Q17.6: *I believe the NSW Department of Education promotes martial arts as an acceptable in‐school sport* (female = 3.07; male = 2.77). Although both groups scored above 2.5, skewing in the direction of positive belief towards this question, there was a level of uncertainty around whether the NSW Department of Education promotes MA as an acceptable in-school sport in both groups. Both participant groups indicated that they would strongly to very strongly (scores ≥ 4.13 out of 5) support the introduction of self-defence or MA (of any kind) into the curriculum, however, participants were less confident in their ability to teach it themselves (female = 3.05; male = 3.32).

Perceived benefits of martial arts training

A statistically significant difference ($p = 0.001$) was seen in question 18.3: *Martial arts training can improve muscular fitness in children and adolescent*s. Male participants responded more strongly to this question, but both groups responded strongly to this question (scores ≥ 4.14 out of 5). Although generally statistically nonsignificant, the 'male' means for 9 out of 10 of these questions were higher than 'female'. All means were skewed in a way that indicates participants believe MA training can provide children and adolescents with physiological and psychological, and social benefits.

Attitudes towards teaching martial arts

No statistically significant differences were seen in this section, however, intergroup difference in Q20.2: *I believe children and adolescents in general would enjoy participating in martial arts training* approached statistical significance ($p = 0.051$), with the 'male' group again scoring slightly more positively toward this belief. Although still in favour (scores ≥ 3.65 out of 5), all respondents were less positive toward teaching MA to students themselves.

Future plans

There were no statistically significant differences between groups. A trend was found, with Q22.1, Q22.2, and Q22.3 all rating the highest among 'female' and 'male' groups. All six questions returned means skewed in favour of MA (mean ≥ 3.21).

Table 6.3 Comparison of means – sex

Beliefs

Question	Field	Female			Male			Total			
		Mean	**N**	**SD**	**Mean**	**N**	**SD**	**Mean**	**N**	**SD**	**Sig.**
Q17.1	I believe martial arts training has a place in a primary school setting	3.59	56	0.85	4.00	30	0.79	3.70	88	0.89	.031
Q17.2	I believe martial arts training has a place in a high school setting	3.86	56	0.82	4.10	30	0.76	3.91	88	0.85	.182
Q17.3	I think all primary school-aged students should have the opportunity to try martial arts training	4.04	56	0.81	4.17	30	0.65	4.03	88	0.82	.446
Q17.4	I think all high school-aged students should have the opportunity to try martial arts training	4.16	56	0.73	4.33	30	0.61	4.22	88	0.69	.273
Q17.5	I believe the NSW K-10 PDHPE syllabus lends itself to the incorporation of martial arts	3.50	56	0.89	3.47	30	1.04	3.44	88	0.98	.877
Q17.6	I believe the NSW Department of Education promotes martial arts as an acceptable in-school sport	3.07	56	0.97	2.77	30	1.10	2.94	88	1.03	.189
Q17.7	Incorporating physical activity of any kind into the instruction of Key Learning Areas (KLAs) such as Mathematics or English could be beneficial for students	4.21	56	0.83	4.27	30	0.83	4.18	88	0.89	.780
Q17.8	Incorporating martial arts training into the instruction of KLAs such as Mathematics or English could be beneficial for students	3.64	56	0.96	3.93	30	1.05	3.70	88	1.03	.199
Q17.9	If self-defence, or a martial art (of any kind) was introduced to the curriculum, I would support this.	4.14	56	0.96	4.47	30	0.63	4.26	88	0.86	.100
Q17.10	If self-defence, or a martial art of any kind was introduced to the curriculum, I would be confident teaching this	3.05	56	1.26	3.32	31	1.35	3.15	89	1.28	.355
Q17.11	A school-based martial arts program that addresses PDHPE syllabus outcomes is appealing	3.84	56	0.99	4.23	31	0.85	3.97	89	0.95	.069
Q17.12	A school-based martial arts program that addresses other KLA syllabus outcomes is appealing	3.82	56	0.97	4.19	31	0.75	3.93	89	0.92	.069

Perceived benefits of martial arts training (Each statement began with ''*Martial arts training can…''*)

Question	Field	Female			Male			Total			
		Mean	**N**	**SD**	**Mean**	**N**	**SD**	**Mean**	**N**	**SD**	**Sig.**
18.1	...help increase energy levels in children and adolescents	4.06	53	0.80	4.35	31	0.76	4.16	86	0.78	.095
18.2	...improve aerobic fitness in children and adolescents	4.13	53	0.83	4.39	31	0.67	4.22	86	0.77	.150
18.3	...improve muscular fitness in children and adolescents	4.15	53	0.74	4.68	31	0.54	4.34	86	0.71	.001

19.1	...improve mental health in children and adolescents	4.13	53	0.79	4.32	31	0.65	4.20	86	0.73	.258
19.2	...improve motivation to exercise in children and adolescents	4.09	53	0.84	4.32	31	0.70	4.16	86	0.80	.205
19.3	...help children and adolescents feel like they can persevere and accomplish more	4.13	53	0.83	4.39	31	0.62	4.21	86	0.77	.142
19.4	...help children and adolescents feel more motivated at school	3.98	53	0.89	4.16	31	0.82	4.03	86	0.86	.359
19.5	...help children and adolescents feel more motivated at school	3.96	53	0.78	4.19	31	0.65	4.03	86	0.74	.170
19.6	...help children and adolescents get along better with other people in their life (e.g., family, class mates, friends)	3.85	53	0.86	4.00	31	0.73	3.88	86	0.82	.416
19.7	...address violent / anti-social behaviour in schools	4.00	53	0.78	3.94	31	0.89	3.95	86	0.83	.730

Attitudes towards teaching martial arts

Question	Field	Female			Male			Total			
		Mean	N	SD	Mean	N	SD	Mean	N	SD	Sig.
Q20.1	I believe children and/or adolescents in the class(es) I teach would enjoy participating in martial arts training	3.96	53	0.83	4.19	31	0.70	4.02	86	0.80	.197
Q20.2	I believe children and adolescents in general would enjoy participating in martial arts training	4.02	53	0.82	4.35	31	0.61	4.13	86	0.76	.051
Q20.3	I would enjoy teaching martial arts to students	3.66	53	1.04	3.94	31	1.15	3.76	86	1.07	.263

Future plans

Question	Field	Female			Male			Total			
		Mean	N	SD	Mean	N	SD	Mean	N	SD	Sig.
Q22.1	In the future, I would be interested in learning how to incorporate martial arts in a classroom setting	4.08	52	0.86	4.03	31	0.95	4.04	85	0.91	.826
Q22.2	I would be interested in attending professional development / accreditation to learn how to teach basic martial arts techniques to my students	3.92	52	1.03	3.97	31	0.95	3.92	85	1.00	.844
Q22.3	In future, I would be interested in a martial arts-based program that also improved NSW KLA syllabus outcomes	3.87	52	0.86	4.06	31	0.85	3.93	85	0.86	.311
Q22.4	If martial arts were introduced into the NSW curriculum, I would outsource the instruction, rather than teach it myself	3.65	52	0.97	3.65	31	0.92	3.64	85	0.95	.968
Q22.5	In the future I would be comfortable incorporating martial arts in my own classroom	3.52	52	0.98	3.87	31	0.89	3.64	85	0.95	.105

Question	Field	Female Mean	Female N	Female SD	Male Mean	Male N	Male SD	Total Mean	Total N	Total SD	Sig.
Q22.6	In the future I plan on participating / training (or continuing) in some form of martial art (e.g., Boxing, Kickboxing, Wrestling, Jujitsu, Karate, Taekwon-Do etc)	3.21	52	1.16	3.48	31	1.31	3.31	85	1.24	.328

Most beneficial martial arts topics for children and adolescents

Question	Field	Female			Male			Total			
		Mean	N	SD	Mean	N	SD	Mean	N	SD	Sig.
Q23.1	Movement / Parkour type activities (e.g., rolling, jumping, vaulting, falling safely)	4.22	51	0.70	4.26	31	0.63	4.21	84	0.68	.784
Q23.2	Learning how to dodge and block attacks	4.22	51	0.67	4.39	31	0.62	4.27	84	0.65	.252
Q23.3	Learning how to punch	3.73	51	1.08	3.84	31	1.00	3.73	84	1.08	.637
Q23.4	Learning how to kick	3.73	51	1.04	3.87	31	0.99	3.74	84	1.05	.534
Q23.5	Grappling / Wrestling (e.g., how to safely escape if tackled or grabbed)	3.92	51	0.94	4.26	31	0.86	4.05	84	0.90	.107
Q23.6	Teamwork / team building activities among classmates	4.53	51	0.61	4.55	31	0.72	4.52	84	0.65	.899
Q23.7	Wellbeing / ethical discussions at the end of each session, focussing on topics such as respect, integrity, self-control etc.	4.49	51	0.61	4.55	31	0.68	4.50	84	0.63	.689
Q23.8	Olympic martial arts: Judo, Taekwon-Do & Karate	3.75	51	1.07	3.97	31	0.88	3.80	84	1.04	.333
Q23.9	Learning katas / forms / poomsae (set movement routines)	3.73	51	1.00	3.77	31	1.09	3.70	84	1.06	.837
Q23.10	Meditation / mindfulness	4.41	51	0.78	4.29	31	1.07	4.37	84	0.89	.555
Q23.11	Learning how to use various traditional weapons (e.g., swords, Bo staff, Kali sticks)	3.08	51	1.32	3.03	31	1.33	3.04	84	1.32	.879

N=Number of responses; S.D.=Standard Deviation; Sig.=Significance. NOTE: two participants who selected 'Other' for sex so were not included in the sub-group analysis due to small numbers

Most beneficial martial arts topics for children and adolescents

No statistically significant differences were found in this section. Each gender shared a number of commonalities among the five highest mean scored topics. Q23.6: *Teamwork/team building activities among classmates*; Q23.7: *Wellbeing/ethical discussions at the end of each session, focussing on topics such as respect, integrity, self-control and so forth*; Q23.2: *Learning how to dodge and block attacks*; Q23.10: *Meditation/mindfulness*; Q23.1: *Movement/Parkour type activities (e.g., rolling, jumping, vaulting, falling safely)*; and Q23.5: *Grappling/ wrestling (e.g., how to safely escape if tackled or grabbed)* were all shown to be included in the topics with the highest mean scores among each group. Q23.6: *Teamwork/team building activities among classmates* and Q23.7: *Wellbeing/ethical discussions at the end of each session, focusing on topics such as respect, integrity, self-control and so forth* both scored as the highest, or second-highest mean score given by each group.

Qualitative feedback

Concerns for the inclusion of martial arts in [my] school:

There were two trends in the areas of concern given by respondents. The most common concern related to a perceived risk of injury. Several respondents voiced their concerns of *Legal issues i.e., kids getting hurt*, and *how [they] would control it to ensure no one gets hurt*. The other common concerns were related to the *promot[ion] of violence in the school setting*, and the *incorrect use* in the playground, practising unsupervised.

Suggestions for increasing the implementation of martial arts in schools

Again, two distinct trends emerged in these suggestions. The first being professional learning and resources. Respondents suggested to *give teachers and preservice teachers training and to provide easy to use resources including a website with videos to follow step by step*. The second trend was a suggestion for MA to have *a focus … on self-defence rather than fighting, as well* *as a promotion of a ... teamwork component & ... mental wellbeing aspect & how it can positively impact* participants.

Discussion

This questionnaire provided new insight into a selection of Australian teachers' (practising and undergraduate) views and beliefs relating to MA and the implementation of such training in school settings. While the data indicates high levels of support for MA in school settings, some respondents showed their concerns for the safety of students, and the potential of students getting hurt. Interestingly, the Australian Institute of Health and Welfare Australian sports injury data (collected) 2012‑2013 ranked MA (labelled combative sports and including Aikido, Chi Kung, Judo, Jujitsu, Karate, Kendo, Kick-boxing, Ninjitsu, Taekwon-Do, Tai Chi, and Martial arts [other]) as the 10th most commonly associated with hospitalised sport-related facial fractures, shoulder dislocations, and injury to the cervical spine (Australian Institute of Health and Welfare, 2017). Sports such as Rugby union, Australian Rules football, Rugby league, Soccer, and Cycling respectively were associated with greater injury rates on these areas than MA (Australian Institute of Health and Welfare, 2017). Of note, in other injury categories, such as sport-related cruciate ligament injury or head injuries combative sports did not rank in the top 10 (Australian Institute of Health and Welfare, 2017). Additionally, in a study based on major trauma cases and deaths in the state of Victoria, Australia over a 10-year period, the highest three frequencies were in cycling, motor sports and equestrian activities (Ekegren et al., 2018), with neither Combative Sports nor MA of any kind ranking at all. It is also important to note that these results are from competitive and/or leisure and community based sport. School-based activities are usually at a foundational and noncompetitive development levels, and thus present a lower risk of injury.

As stated by a multitude of researchers (Angleman et al., 2009; Cox, 1993; Chan, 2000; Martin, 2006; Woodward, 2009), one of the main barriers preventing people from taking up

MA as a hobby, or welcoming MA into the school environment, is the misconception of traditional MA. Traditional MA training often becomes misinterpreted and associated with the fighting skills and violence that are glorified and propagated in movies, television shows and other popular culture (Lu, 2008b). The ‘martial artist’ stereotype depicted in these films finds themselves in several situations, in which he or she has to defeat an opponent (or a whole room full of opponents) using acrobatics, choreographed kick combinations, and weapons. The kicking and screaming of Bruce Lee is often mentioned as an example of the MA stereotype. This seemingly works in two ways. The first being that his superior fighting skills highlight the violence typically associated with MA, which leads to the misrepresentation that is being discussed. The second stereotype being that his signature screams and sounds, along with his small stature and regular attack of the larger opponent's groin seem to undercut his legitimacy as a tough, heterosexual warrior (Chan, 2000), and project the martial artist as a dirty fighter (someone that fights using unfair or frowned upon techniques) with a high-pitched scream. Both stereotypes are counterproductive in attaining MA acceptance in school settings. The first highlighting a largely misrepresented emphasis on violence, and the second displaying a lack of normative hetero-masculinity (Chan, 2000) by the male practitioner, although the actuality being that these activities are open to participants of all skill and fitness levels, sex and age. This may influence those who plan school PDHPE programs, and in turn, deter the incorporation of MA training.

In addition to concerns of the perceived danger of MA training, many respondents also showed a lack of knowledge relating to the current NSW Department of Education School Sport Unit rules and regulations for the safe delivery of MA training in schools. One independent schools-based respondent noted that it is [my] understanding that these types of activities are banned. Additionally, the majority of teacher respondents indicated that they did not believe the NSW Government views MA training as an acceptable school sport. An investigation into the NSW Department os Education School Sport Unit website proves this belief to be misinformed, and provides a Sport safety guidelines document for MA. With the majority of respondents having less than 4 years teaching experience, this gap in knowledge may be attributed to a lack of exposure throughout their preservice teacher training, or professional development for qualified teachers. A recommendation for this may be to include a brief introduction to MA and various simple MA activities at university for preservice primary school and PDHPE specialist teachers.

Strengths, limitations and suggestions for future studies

It should be noted that none of the school principals agreed to invite their teachers to participate, with all responses coming through social media or undergraduate university courses. To the authors' knowledge this is the first survey study to investigate preservice and inservice teachers' perceptions of MA in Australia. None of the 22 school principals invited to complete the survey accepted the invitation. As a consequence, this sample size is too small to make conclusive generalisations about the views and beliefs of the target population. However, it provides an insight into the views of a diverse group of teachers and preservice teachers. This study provides a strong case for further investigation into this topic across all states of Australia. A larger sample size is required to form conclusive generalisations on this topic. One solution to the sampling issue would be to request that the same questionnaire could be sent out by the NSW Department of Education, to all teachers. Furthermore, this survey could be sent out to other states and countries, with comparisons made between each.

Perspective

This study indicates a high level of support for MA in school settings in a sample of current teachers and preservice teachers from Australia. Many participants did not realise that 'NSW Government School Sport' had a protocol for teaching MA. The results indicate that teachers and preservice teachers view MA as a worthwhile activity, with a range of benefits including physiological and psychological, and support the inclusion of MA in school settings.

These findings may provide support to advocate for more teacher training and professional development to enable the safe delivery of MA, and/or high quality PDHPE (and school sport) programs that draw from MA to deliver key outcomes in PDHPE. Furthermore, respondents indicated their support for MA content in school programs that incorporate teamwork, wellbeing/ethical discussions, learning how to dodge and block attacks, meditation/mindfulness, movement/parkour activates, as well as grappling/wrestling. This allows for the creators of future intervention, PDHPE, or sport programs to provide programs that incorporate the input provided by current and preservice teachers. This may in turn assist with school engagement with sports medicine-based interventions, as such interventions are now able to reflect content that the teachers have shown to value and view as beneficial to students. Although a larger study is recommended to strengthen these conclusions, this study provides Australian school authorities with a baseline to further support teachers in their efforts to incorporate MA in school settings, through the provision of preservice teacher training, professional development for current teachers, or resources and program development.

AUTHOR CONTRIBUTIONS

Louis Burt: Conceptualisation; data curation; formal analysis; investigation; methodology; project administration; resources; writing–original draft; writing–review & editing. Nicholas Riley: Conceptualisation; formal analysis; investigation; methodology; project administration; supervision; writing–review & editing. Narelle Eather: Conceptualisation; formal analysis; investigation; methodology; project administration; supervision; writing– review & editing.

DATA AVAILABILITY STATEMENT

Data available on request from the authors.

ETHICS STATEMENT

This study was approved by the Human Research Ethics Committee of [The University of Newcastle]. Approval number: H-2019-0057.

TRANSPARENCY STATEMENT

The lead author Louis Burt affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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Chapter 7. Discussion

7.1. Overview

This thesis has presented four literary pieces, as the following discussion will be broken into corresponding sections.

7.2. Literature review and systematic review

The first section of this thesis was a literature review of the current context of educational research relating to martial arts, as well as the current trends of children and adolescent mathematics and physical activity in Australia. This section detailed the various trends in various trends in mathematical performance, physical activity and wellbeing in Australian school-aged children, followed by a definition of martial arts along with an outline of the scope of martial arts-focused research. This outline detailed the various areas that have been explored, such as the physiological and psychological benefits of martial arts; the culture and history of various arts; and pedagogical approaches to teaching martial arts. Following on from this, the literature review also provided an insight into some of the objections provided against martial arts in schools, and evidence was provided to counter these points an assist the reader in clarifying some of those commonly held misconceptions. The literature review section of this thesis then shifted towards a more specific point of investigation through the production of a systematic review that investigated martial arts-based intervention programs in school and community settings. This review provided further evidence to support the suggested cognitive, psychological and physiological benefits that martial arts training can provide to children and adolescents. This research study also provided a baseline for the next section of the thesis.

7.3. The Kick-Smart program

The findings of the systematic review provided a foundation to confidently argue that a meticulously designed martial arts-based intervention program has the potential to provide positive benefits to Australian school-aged children. This section of the thesis consisted of a study produced for the conceptualisation, creation, delivery and assessment of such a program. This published, peer-reviewed study presented a pilot randomised control trial comprising a six-week martial arts-based intervention program that incorporated games-based learning of stage-appropriate mathematics skills. The study returned statistically significant results in physiological improvement and academic achievement in favour of the intervention group, and thus provides further evidence for the feasibility and efficacy of martial arts training and martial arts-based interventions for school-aged children.

These positive results may be attributed to the program aligning with multiple aspects of Self-Determination Theory (SDT) (Deci & Ryan, 1985; Ryan & Deci, 2017) and the Wellbeing Framework for Schools (Department of Education and Communities, 2015). These links will be further discussed and explored in section 7.6. However, in brief, the statistically significant results may be ascribed to the combination of intentional support of participant wellbeing (e.g., autonomy during activities; scaffolding of activities to provide students of all skill levels opportunities to experience success) and multiple aspects of SDT. For example, the combination of appropriately scaffolded, fun, relevant activities that increased participant competence may have led to more autonomous engagement and higher motivation, which in turn may have led to greater levels of intrinsic motivation (Deci & Ryan, 1985; Ryan & Deci, 2017; Vasconcellos et al., 2020).

7.4. The Kick-Smart Homework program

The subsequent chapter followed on from this study in the form of a second pilot randomised control trial, which presented a modified home-based version of the Kick-Smart program.

Recruitment rates, as well as student reading ability, required alterations to be made to this program. The consequent focus group interview returned positive results relating to potential feasibility in different settings. Additionally, the focus group provided useful insight into the reasons as to why the study faced retention and adherence issues, with a lack of family support being one of the major factors relating to students not completing the program as designed. As discussed in this study, this finding was congruent with other studies with a homework component. Another point to note is that the program did not align with the homework policy (or lack thereof) of the school. While the content was directly linked to age-appropriate curriculum outcomes relevant to the participants, the absence of a clear homework policy (that is upheld across the school) may have impacted the retention and adherence rates. The feedback from participants can be taken into consideration for any future studies that may stem from this project. In future programs, further support for students such as a weekly check-in from the research team or video resources to assist students at home, may be beneficial for participant satisfaction as well as retention and adherence rates. This aligns with the socio-ecological model by targeting the home as well as the school environment. If resources are made available to students and their families to access at home, this engages with a greater breadth of influential factors in the learners' contexts, which is important for behavioural change in both mathematics and physical activity.

7.5. The Kick-Smart questionnaire

The next section of this thesis provided the results of a cross-sectional survey study. The article broke down the results of a questionnaire that investigated the views and beliefs of current and pre-service teachers towards the inclusion of martial arts in school settings, and martial arts in general. The research compared results between various sub-groups (e.g., male and female respondents). Analysis showed very little difference between any subgroups and a largely positive outlook towards the benefits of martial arts in schools, as well as an interest among teachers and pre-service teachers in participating in professional learning to better understand how to incorporate martial arts into the classroom. This feedback, positively skewed towards martial arts, may be attributable to the growth of martial arts around the world and a growing understanding, or at least awareness, of what such training involves and of its benefits. With sports such as Brazilian Jiu-Jitsu growing at quite a fast rate over the last 20 years, more and more people are becoming involved in, or know someone who is involved in, martial arts – and with greater exposure and understanding may come a greater level of acceptance. This research provides a starting point for those interested in promoting school-based martial arts programs in schools, as they are able to incorporate feedback provided by those who would be involved in the delivery of such programs. Additionally, this provides a basis to further investigate this subject on a larger scale.

7.6. Significance

The significance of the content of this thesis is multilayered. It presents original research and evidence on local, national and international levels. On a local scale, this work provides a novel program shown to positively impact academic and physiological outcomes in participants. This is able to be run at local schools, should they wish to implement such a program. On a national scale, the success of the Kick-Smart program pilot randomised control trial shows that martial arts-based programs may be a viable in-school option for teachers to implement in their classrooms and schools. This program provides teachers with a high-quality option to meet the interests and needs of students who may not take an interest in other physical activity content.

Meeting these needs and interests, as well as other factors discussed in section 7.3, shows that Kick-Smart aligns with aspects of the Self-Determination Theory (SDT) (Deci & Ryan, 1985; Ryan & Deci, 2017). The teacher's consideration of student interest when programing and delivering content meets the need for students to feel a sense autonomy, promoting a greater experience of willingness in their actions and engagement in their learning.

Further to this, the program is scaffolded to allow students to gradually build competence through age-appropriate activities based on achievable outcomes. Previous research suggests that teachers are more able to influence students' autonomy and competence, while peers seem to have more impact on students' relatedness (Vasconcellos et al., 2020). Ryan and Deci (2017) present relatedness as a need for connectedness with significant others, satisfaction with the social world, and a feeling of being accepted. As noted in Chapter 2, MA may provide a unique environment to foster connectedness with frequent exchanges of trust with peers that share similar interests. For example, when students practise MA techniques, they often put each other in physically vulnerable positions and must trust their peers not to injure them (Chinkov & Holt, 2016). This in turn may provide teachers with the potential to impact the third fundamental need in SDT (relatedness) in a more meaningful way. With these three elements of SDT promoted and supported, Kick-Smart may provide teachers with a program that is able to positively impact student motivation and engagement in physical activity. Further to aligning with SDT, many elements of Kick-Smart are situated within the Wellbeing Framework for Schools (Department of Education and Communities, 2015). Table 7.1 outlines this.

Table 7.1. Alignment of Kick-Smart with The Wellbeing Framework for Schools

Framework Theme	Framework indicators	How Kick-Smart meets this criteria
Connect	Students are actively connected to their learning through meaningful, engaging and rewarding personalised learning experiences.	Provides students with the option to engage in novel content that may suit their interests
	Students have positive and respectful relationships with each other, their teachers and the community.	Respect and qualities if respectful relationships are explicitly taught in the program
	Students are self-aware and regulate their own emotions and behaviours. Students have the social and emotional skills to develop and maintain positive relationships and engage in pro-social behaviour.	Self-control, emotional regulation and pro-social behaviour is explicitly taught in the program

Framework Theme	Framework indicators	How Kick-Smart meets this criteria
Succeed	Students are confident and resilient learners. They have positive self-esteem, stretch themselves and take risks in their learning. They demonstrate self-discipline and effort toward their learning.	Courage, resilience/perseverance and self-esteem are explicitly taught and discussed in the program
	Students are provided opportunities to succeed and success is celebrated in a way that is meaningful to the student.	Content of both programs (Face-to-face & Homework) is intentionally scaffolded to provide opportunities for learners to experience success and progress at all levels
	Staff enable success by personalising student learning and supporting students to achieve.	
	Staff enable success by contributing to a positive, supportive and encouraging learning environment.	See 'Supportive' element of the SAAFE framework (Lubans et al., 2017), on which this program is based
Thrive	Student learning takes place in an environment which fosters and develops choice, accomplishment, positive relationships, enjoyment, growth, health and safety.	Program was developed using the SAAFE (Supportive, Active, Autonomous, Fair and Enjoyable) principles (Lubans et al., 2017)
	Students are self-directed, take initiative and grasp opportunity.	Program provides opportunities for students to take initiative and direct some of their own learning experiences (e.g. Origami Ninja Stars activity)
	Students contribute to the learning of other students and to the school community more broadly.	
	Staff contribute to environments which allow students to thrive by delivering high quality learning experiences.	Program is evidence-based and incorporates current best-practice theories and frameworks.
Enabling School Environment	Students are provided with opportunities to exercise choice in the context of self-regulation, self-determination, ethical decision making and responsibility.	Program was developed using the SAAFE (Supportive, Active, Autonomous, Fair and Enjoyable) principles (Lubans et al., 2017)
		Program explicitly incorporates multiple discussions and activities that target self-regulation, perseverance, ethical decision making and responsibility
	Schools provide learning experiences that contribute to the development of individual character traits and positive group dynamics.	Program explicitly includes activities to promote positive group dynamics and teamwork.

The results from the questionnaire study provide national level information relating to current and pre-service teachers' views and beliefs concerning martial arts and the incorporation of such into school settings. Despite the small sample, the questionnaire results provide a starting point for observations of incorporating martial arts into school settings along with information on the barriers and challenges to doing so, which is valuable knowledge for the implementation of such programs in schools.

As discussed in the introduction of this thesis, some of the barriers to martial arts being implemented into Australian school settings may be misconceptions about martial arts and martial arts practitioners. Additionally, the cross-sectional study results suggest that teachers feel that a lack of knowledge of martial arts, and lack of teacher training opportunities for this, is the main barrier preventing martial arts being taught in their schools. Teachers around Australia who may be willing, but hesitant, to implement martial arts training into their school or classroom may interpret the information presented in this thesis, and subsequent research studies, and feel more confident in the implementation of this content. On an international level, this thesis adds vital evidence to a limited field of research by presenting a systematic review of martial arts-based intervention programs around the world; providing programs that others may wish to implement and test in their own countries; and giving readers an insight into the views and beliefs of Australian teachers in relation to martial arts in school settings. This research, and the positively skewed results in all sections towards martial arts in school settings, may also provide a solid foundation to present an argument to insert martial arts into the Australian curriculum, similar to the system that has been operating successfully in the Japanese education system for many years.

7.7. Strengths and limitations

Due to the format of this thesis, this section has been broken into sections relative to the studies presented.

7.7.1. Systematic review

There were several methodological limitations found in the existing studies, including limited high-quality quantitative (e.g., RCT) designs (n=25). A lack of detail in key areas was also an area of limitation – for example, sample size was inconsistently reported and many did not provide sex of participants, which prevented meaningful comparisons between male and female participants. Inconsistent and/or vague presentation of participant age also creates unnecessary difficulty in interpreting and presenting the studies. A large percentage (n=21) of studies also had small sample sizes (<50 participants). Additionally, when one considers the vast array of MA around the world, very few styles were studied, with a clear lack of studies focusing on grappling-based arts or mixed martial arts. Recommendations for future studies include larger sample sizes and greater detail in key areas (e.g., sample characteristics), as well as greater detail of content delivered (e.g., a sample lesson) and who sessions are taught by and what their qualifications are. RCTs are also recommended to be used when conducting further studies in this area. One strength of this review is that prior to publication, the study was updated using a second search using the same method. This returned numerous papers published between the first search and the second search conducted in 2022 and thus allowed the study to be more relevant to the current academic climate in this research field. As with all research, a limitation is the currency of the information. Therefore, this systematic review would benefit from being conducted at regular intervals to update the information.

7.7.2. The Kick-Smart program

This was a unique and innovative program that specifically integrated physical fitness, wellbeing and academic achievement within the primary school PDHPE and Mathematics curriculums. The study used trained assessors and observers for all assessments and observations. Clearly, an additional benefit to school-based curriculum interventions is that unless a child leaves the school they remain in the study for its full duration, and as such retention rates are high. There are, however, some limitations that should be noted. While the results of the study are positive, it is worth noting that the program was delivered by the researcher, a qualified primary school teacher with several years teaching experience and extensive martial arts knowledge. Further studies will need to evaluate the effectiveness of classroom teachers in delivering the program to assess both the sustainability and useability of the program in the school setting.

The single biggest barrier to the integration of this program may be teachers' own beliefs about, perceptions of and attitudes towards martial arts. It has been shown that social support provided by classroom teachers arbitrates changes in children's physical activity behaviours. It therefore seems imperative that teachers have input into the planning of subsequent studies. Indeed, a recent systematic review has highlighted the need for teachers to act as agents of change and to be involved in the delivery of subsequent programs to improve the cost effectiveness, sustainability and feasibility of programs (Erwin et al., 2012). A key part of this will need to be gaining an understanding of teachers' beliefs, perceptions and attitudes in relation to martial arts and their integration into school settings. Furthermore, professional learning focusing on up-skilling teachers in this area will be needed.

It is possible that factors outside the intervention may have been responsible for the greater increase in the 20 m repeated shuttle run test results among participants in the control group from baseline to follow-up. Despite this being a group RCT, the intervention was carried out in a single school and the analysis could not take into account clustering. While the authors cannot be sure as to why there was a greater improvement among the control group, it is worth noting that the control group were participating in regular PDHPE lessons, which were based on touch football. Activities from these sessions may or may not have influenced the cardiorespiratory endurance of the control group and is an area of potential further study.

One of the successes of this program may be attributed to the use of the pedagogy document (see *4.2 Pedagogy of the Kick-Smart program*). This document incorporated a range of evidence-based strategies that provide the teacher with considerations for students with special needs, as well as student engagement such as the SAAFE Teaching Principles (Lubans et al., 2017) and behaviour management strategies and behaviour progression chart. In addition to the above impacting the success of this program, it should also be noted that the program was delivered by a specialist teacher who had not only qualifications and experience in primary teaching but also extensive martial arts credentials and experience.

It is important to note that many interventions do not last beyond the study period. In efforts to increase ecological validity, providing teachers with training and professional learning may be of use so that they can continue to deliver lessons that integrate martial arts and physical activity in a flexible way that can be adjusted to the needs of their class. Insufficient time, limited professional development opportunities and access to resources have been reported by a group of teachers as the main barriers to providing classroom-based physical activity to Australian students (Macdonald et al., 2019). The successful integration of multiple Key Learning Area outcomes into a single program, such as the Kick-Smart program, may be an effective approach to addressing the issue of over-crowded curriculums, and improving physical fitness throughout the school week (Mavilidi et al., 2018).

Based on the flow of the program, and feedback and discussions with teachers and researchers, it may be useful to program the lessons to run for a maximum of 45–50 minutes, rather than the originally intended 60 minutes. This may be more applicable for primary school settings, as it may fit within timetable teaching sessions with greater ease. A further recommendation may be to utilise a different measure of wellbeing in future studies, as this did not yield any significant results.

7.7.3. The Kick-Smart Homework program

The trial was run at a single school, in a low socio-economic area renowned for low recruitment rates for studies and for permission slips not being returned for other school events. Furthermore, students at this school traditionally have a low rate of returning homework set by teachers. This proved to be the case with this study. It should also be noted that one of the researchers was a teacher at this school at the time the study was conducted. This may have impacted upon the return of permission slips, as this member was able to remind students on a regular basis to return the note. The recruitment rates may have been even lower had this not been the case.

While accepted as a developmentally appropriate assessment, during administration of baseline assessments the student self-efficacy and engagement in mathematics assessment proved too difficult for students to comprehend by themselves. Due to time constrains and risk of bias, the research team made the decision to halt this assessment. In lieu of the student self-efficacy and engagement in mathematics assessment, the test group took part in a focus group at follow-up, where several questions from this assessment were asked in a more appropriate form for the participants.

A weakness of this study was the number of participants. While recruitment of schools proved challenging, with only a single school accepting the invitation to participate in the study, the numbers for this study were further influenced by student recruitment. This came down to two factors. The first is that the school is notorious for (as was noted to the research team) poor rates of returning signed permission slips for any event at the school. Furthermore, the COVID-19 pandemic interrupted the flow of this study between initial recruitment of the school and the beginning of baseline assessments, with the study being put on hold until January 2021. This may have impacted the excitement and interest of the participants, as the initial introduction to the program happened the year prior, and thus some of the novelty of the program may have worn off. In turn, the numbers for this trial were based solely on the maximum number of eligible students able to be recruited prior to commencement of baseline assessments. A randomisation envelope was planned to be used as the mechanism to allocate classes to test or control conditions; however, due to recruitment issues and inadequate sample sizes, students were allocated to test or control conditions at an individual level, with names being drawn out of a hat. This may have impacted retention and adherence, as students were not completing the program as a class, with the ability to discuss it with their peers; rather, individuals from each class were completing the program, and may have felt isolated and unsupported.

7.7.4. The Kick-Smart questionnaire

It should be noted that none of the school principals agreed to invite their teachers to participate in the questionnaire. The most commonly noted factor for this was a lack of time to participate. Consequently, all responses came through social media or undergraduate university courses. To the authors' knowledge this is the first survey study to investigate pre-service and in-service teachers' perceptions of MA in Australia. Despite the small sample size – inherent in many survey studies (Wang & Cheng, 2020) and compounded by the fact that school principals did not agree to distribute the questionnaire and other avenues, including social media, being used for recruitment – this does provide valuable information about teachers views and beliefs of MA in schools This study provides a strong case for further investigation into this topic across all states of Australia, with a larger sample from a more diverse group of teachers which would allow comparisons across states and territories, and potentially internationally. One solution to the sampling issue would be to request that the same questionnaire be sent out by the NSW Department of Education to all teachers.

Chapter 8. Conclusion

This chapter concludes the thesis by summarising the findings of each of the studies and providing suggestions for further academic engagement in each of these areas. The chapter will then take a closer look at the Kick-Smart program and its future in the world of academia and school settings. This will be followed by a presentation of the implications of the original findings of this thesis, followed by recommendations for the field in general and my concluding remarks.

8.1 Summary of findings

8.1.1 Systematic review

The available data presented in the systematic review suggests that martial arts-based interventions can have a positive effect on physiological and psychological outcomes, as well as cognitive outcomes in children and adolescents when delivered in school and community settings. However, high risk of bias and heterogeneity in study outcomes and study methodology limit the evidence for impact or causality. Further to providing a first-of-its-kind systematic review of the topic and greater evidence within this area of study, this review showed that more high-quality studies are needed to confirm feasibility and utility of school- and community-based martial arts training for improving varied outcomes in children and adolescents.

8.1.2 The Kick-Smart program

After the completion of the Kick-Smart program, positive feedback was received from students and teachers regarding program enjoyment, perceived benefits and future plans. Significant treatment effects favouring the original Kick-Smart group for muscular fitness and mathematics achievement demonstrates preliminary efficacy. Novel findings indicate the Kick-Smart program is feasible for delivery in a primary school setting and effective for improving selected fitness and academic outcomes. Further evidence for the effectiveness of Kick-Smart via a larger randomised control trial is recommended.

8.1.3. The Kick-Smart Homework program

Recruitment (36.62%) and retention (15.38%) levels for the Homework program did not allow for reliable baseline and follow-up data analysis but did indicate that this unique program may not be feasible in a low socio-economic area, where homework is not commonly assigned or compulsory. A focus group interview provided positive feedback towards the program as well as several reasons why students did not complete the activities, including lack of family support. The findings from this study were consistent with other trial programs with homework components, which can be taken into consideration for future versions of this novel program. These findings may indicate this homework program may be more feasible for an older group of children, or a school in a higher socio-economic area where children are statistically more likely to have higher reading levels and receive greater support from the home.

8.1.4. The Kick-Smart questionnaire

The results of this original questionnaire study indicate teachers and pre-service teachers view martial arts as a worthwhile and beneficial activity for school-aged students, and support the inclusion of martial arts in school settings. These novel findings may be useful to inform policy and practice in Australian schools, and the development of teacher education programs, professional development courses, and school-based education programs utilising martial arts to meet physical education learning outcomes.

8.2. A further look into the future of the Kick-Smart program

The Kick-Smart program had positive preliminary findings. This section will discuss the following two areas: feasibility of both the in-school program and the homework program; and program components – what should be kept and what may be changed for future versions.

8.2.1. Feasibility

The in-school program showed excellent preliminary feasibility in all areas (recruitment [92%], retention [96%], adherence [85.66%], compliance [83.33], and satisfaction [scores from teachers and student participants rated all sections of the program ≥4 out of 5]). Additionally, no injuries were sustained by any of the participants – indicating a degree of safety surrounding the sessions. The Kick-Smart Homework program, as described in previous sections, received poor feasibility scores, with limited recruitment, adherence and compliance. The satisfaction of this program was investigated in the form of a focus group interview with the participants. Many noted enjoyment of the activities that they did complete. Findings suggest this program may be feasible at a school in a location with higher socio-economic status and/or placing more value on the completion of homework.

8.2.2. Program components

The Kick-Smart program and Kick-Smart Homework program were directly related to curriculum outcomes for mathematics and PDHPE learning areas for stage three and stage two respectively. As noted above, the in-school program received excellent participant satisfaction scores from the student participants and their supervising teachers. Furthermore, the results from the questionnaire study showed that current and pre-service teachers hold the components of the program in high regard. From a practical perspective, the gymnastics equipment required in Week 1 on the Kick-Smart program would be an additional cost, and difficult to move in and out of learning spaces should a school not have this equipment already in their resources or access to the university's resources. During the homework program the student self-efficacy and engagement in mathematics measure, using a modified (stage appropriate) version of the Programme for International Student Assessment (PISA) scales, proved too difficult for most of the student participants to complete independently. This resulted from low reading skills, as is common in schools situated in areas of low socio-economic status and among students from low socioeconomic backgrounds (Thomson et al., 2019). This needs consideration for future trials of this program, and necessary modifications should be made to meet the needs of these students. This may include a further simplified version of this assessment and/or a digital, interactive version that is able to read each question to the student.

8.2.3. Future directions for the Kick-Smart program

The positive results present a hopeful future for this program as a whole. The findings from this research suggest that the program be refined and delivered on a larger scale. To up-scale the program, teachers will need to be trained in how to deliver the program, rather than a single fully trained martial arts instructor/educator delivering the program everywhere. Kick-Smart-specific teacher professional learning courses will need to be developed. Face-to-face learning would be the ideal delivery and assessment method for this type of embodied learning and transfer of physical skillsets; however, a hybrid delivery combining online modules with face-to-face components may also prove feasible, particularly when taking into consideration the shift towards, and modern teacher familiarity with, online meetings and delivery modes since the COVID-19 pandemic. It may also be beneficial to pursue the viability of this professional learning counting towards New South Wales Education Standards Authority (NESA) professional development hours, required for the maintenance of teacher accreditation. This may be pursued through NESA, as per its *Accreditation of Professional Development Courses*

Policy

Accredited teachers in NSW government schools must meet the Australian Professional Standards for Teachers. Teacher accreditation is a mandatory part of ongoing professional development (NSW Education Standards Authority, 2017). High-quality professional learning (PL) helps teachers to continuously improve and maintain their teaching practice and develop their careers. The NSW Department of Education has 1638 elementary schools, with approximately 50% located in the Sydney metropolitan area and the remainder spread over a geographical area of over 800,000 square kilometres. As traditional face-to-face professional development offerings for teachers have been impacted by the impact of COVID-19 (school closures, restrictions to travel and general cancellation), teachers have had to turn to online delivery of professional learning for support and it has therefore been crucial that providers of such learning transition to a more flexible delivery style. In fact, it may be argued that these online approaches may provide a promising avenue for more accessible and equitable delivery of teacher professional learning due to NSW's vast geographical area. Coupled with this demand for online training has been an increasing requirement that professional learning offer solutions to teacher-identified barriers or state or national policies, and it is critical that this learning 'works' and is therefore evidence-based (Lewis, 2017). While there is limited research in this field, current literature suggests the creation of a successful, high-quality physical activity and/or Fundamental Movement Skills professional learning course will require the content to: run for ≥1 day; provide comprehensive subject and pedagogy content; be framed by a theory or model; provide follow-up or ongoing support; and measure teacher satisfaction with the training (Lander et al., 2017).

Key facilitators must be considered to ensure successful up-scaling and sustainability of the Kick-Smart program. Previous research suggests that support, commitment to and belief in the value of the program from staff – particularly senior leadership – has a positive impact on engagement with, and sustaining of, intervention programs (Herlitz et al., 2020). This may suggest greater communication and supports shared between intervention facilitators and aforementioned school staff, such as chat groups, online resources and informative email content. Contextual factors must be considered, such as advocating the normalisation of teachers and schools prioritising of physical education outcomes within time and funding/resource constrained school settings (Herlitz et al., 2020). This may be addressed by providing affordable professional learning that includes clear evidence of links between Kick-Smart and academic performance, as well as identifying the multiple outcomes from both PDHPE and mathematics syllabi. Further to this, it has been identified that sustainability of interventions can be positively impacted by adapting the intervention to existing routines and changing contexts (Herlitz et al., 2020). This may be addressed by consulting with teachers and leadership teams within schools to tailor the program to the routines and contexts of the intervention site. This proved effective in the pilot trial of the Kick-Smart program.

8.3. Implications

The implications of the research and evidence presented in this thesis is multifaceted. This thesis shows that martial arts training can be undertaken in primary schools in a safe and developmentally appropriate educational format. The cross-curricular learning focus of the Kick-Smart programs, combining physical education and mathematics, may increase confidence among teachers and education authorities to include this type of activity in lists of promoted exercises and activities in schools. This research, and the future directions of the Kick-Smart program, raises the question of what is needed to make the notion of martial arts in Australian schools more approachable and accessible for teachers. A starting point for this may be NESA, and the professional learning modules and courses it provides. This research is also a starting point for the inclusion of martial arts training in physical education.

The inclusion of Kick-Smart in school settings may help promote engagement in physical education through a novel and engaging activity for those students less inclined to participate, as well as life-long physical activity through exposure to less common activities that students may not otherwise experience but may develop an interest in.

Additionally, this thesis provides information to reduce the divide between people who are untrained in martial arts, or who have had limited or no exposure to martial arts of any kind, and trained people's understanding of martial arts. This knowledge provides a starting point for martial arts teachers to approach schools and communities about the inclusion of MA within schools, and provides another tool in the tool kit for teachers to deliver knowledge and skills to their students.

Table 8.1. Implications for research	
Research issue	**Steps to address**
Addressing limitations of the current studies	**Martial arts-based intervention programs targeting physiological, psychological, and cognitive outcomes of children and adolescents in school and community settings: a systematic review** • Only searched 3 databases. Include more databases (e.g. PubMed) in any future studies of this nature. • No meta-analysis: Future studies of this nature may benefit from a statistical meta-analysis. **The Kick-Smart program: A randomised feasibility trial evaluating the feasibility and efficacy of a primary-school based martial arts program integrating mathematics, physical fitness and wellbeing.** • Kick-Smart not been tested at scale: Increase range of recruitment that involves a broad range of schools and conduct larger RCT; tailor program to suit different student cohorts such as those from special needs settings, low socio-economic areas, and rural and remote locations, out of school hours (OOSH) setting. • Only tested in specific age groups: Test in various age groups • Facilitated by lead researcher, face-to-face: Develop a professional learning model to train teachers to implement the program as part of their normal practice; Test different models of professional learning across different delivery modes including multimodal (e.g., online) • Program implemented in PDHPE curriculum allocated time: Determine whether program could be implemented during scheduled mathematics times **The Kick-Smart Homework program: The implementation and assessment of a martial arts-based homework program integrating mathematics and physical fitness for primary school children.** • Time consumption of TGMD-3: To ensure feasible measures and reduce impact on schools. Use smaller version • Reduced engagement: Develop a parent/carer engagement program to train parent son how to support their child in participating in the program. **Current and pre-service teachers' views and beliefs regarding martial arts and the inclusion of martial arts in Australian school settings** • Unable to identify or control location of participants: Include question that asks where the participant is from (e.g., country, state)

	• Limited generalisability due to small sample size: Work in conjunction with NSW Department of Education to disseminate the questionnaire to all teachers, state-wide. **Kick-Smart overarching theme** • Only targeted academic performance in mathematics: This program could be tailored to promote other academic subjects such as literacy. • Not conducted at scale: Create professional learning to develop skills for other teachers to deliver the program
Implications for education practitioners	**Implications for Departments** • Embedding novel and engaging martial arts programs that target multiple learning areas may lead to improvements in Physiological and academic outcomes, warranting investment in curriculum development and professional learning • Delivers a program that is heavily in-line with the views and beliefs of current and pre-service teachers. **Implications for Schools** • Provides a safe and effective program that targets multiple outcomes in multiple Key Learning Areas while catering for a broad range of learning needs • Provides a program that explicitly engages students in ethical/wellbeing-based discussion • Provides engaging content that increases daily physical activity levels in students and assists in the programming of such, to meet weekly physical activity requirements. **Implications for teachers** • Provides a pre-written program that targets multiple outcomes in multiple Key Learning Areas, saving hours of programming time for already time-poor teachers • Provides a solution to engaging and motivating students in the classroom in regards to physical and mathematical learning • Subject integration is a time efficient way to meet the requirements of an overcrowded curriculum and addresses physical activity recommendations for schools. • Provides opportunities to increase in-class daily physical activity while meeting other key learning area outcomes.

8.4. Recommendations for the topic in general

From the specialist knowledge and insights gained from completing this research, a number of recommendations can be made for this topic, and for any future research conducted in this field. The first recommendation would be for more school-based martial arts intervention programs to be developed and run within schools across the world. The systematic review provides strong evidence for the benefits of this. The second recommendation would be for a larger RCT of the Kick-Smart program, to be conducted at multiple sites. This would provide additional evidence of the benefits of the Kick-Smart program. Additionally, it is recommended that further study of current and pre-service teachers' views of and beliefs about MA and its inclusion in schools be completed with a larger, more generalisable sample to enable further improvement of future school-based martial arts programs that cater for the needs and expectations of teachers. Finally, based on the positive results from these preliminary studies, more research is encouraged in this field of pedagogy in general, as there is a clear lack of evidence in this domain.

8.5. Concluding remarks

It is clear from the evidence presented in this thesis that martial arts training is a feasible and valuable inclusion in school settings, and one that teachers support, as suggested by the survey study results in Chapter 6. Such activities can have positive effects on academic, physiological, psychological and cognitive outcomes for school-aged participants. The Kick-Smart program provided further evidence to support this, and pre-emptively met many of the suggestions made by participants in the survey study in relation to most valued martial arts content. Further to this, the research in this thesis indicates that teachers are aware of the benefits martial arts training can provide their students and are interested in professional development that can teach them how to incorporate martial arts into their classroom. This field requires greater awareness, more experienced and passionate researchers to conduct further investigations, and government backing to incorporate martial arts into the Australian curriculum. I intend to be at the forefront of this, post-doctorate.

Appendices

Appendix 1: The Kick-Smart Program

KICK-SMART

MARTIAL ARTS

WELL-BEING | MATHEMATICS

The activities and techniques in this intervention program aim to emphasise not only the philosophical points of traditional martial arts, but provide a modern , more relevant approach to this, while reinforcing school values, and Stage 3 Outcomes from Key Learning Areas (KLAs) of the NSW Curriculums.

The "Martial Arts" curriculum will focus on *Fundamental Martial Arts Skills (FMAS)* that have been selected from a variety of martial arts including *Karate, Taekwondo, Kali, Pankration*, as well as some principals of *Kinetic Fighting* (*KEF*), and movement skills from *Hyper Pro Training (Extreme Martial Arts [XMA])* and *Parkour.*

The selection of these techniques are based on my personal martial arts experience over the past 18 years, having graded in all of the martial arts styles listed above, reaching instructor level in all of them. In addition to this, I have also participated, and/or continue to participate in martial arts that include Brazilian Jiu-Jitsu, Defendo – Close Quarters Combat, Sambo, Aikido and Wing Chun Kung Fu.

The aim of the martial arts techniques at face value is to teach simple physical martial arts techniques to the students, such as how to block, strike and grapple. Multiple martial arts schools that I have trained and/or taught at have emphasised the idea of running away from an attacker whenever possible. However, I have not come across many schools that actually teach this skill, e.g. how to overcome obstacles or how to balance on a narrow beam. This makes the inclusion of Parkour relevant.

This program will be taught through two sessions per week, for ten weeks. Each being 1 hour long. This allows for a proper warm up, followed by about 35 minutes of martial arts practice, which will lead into a 10 minute "mat chat" that emphasises the martial arts and academic philosophies focused on throughout the week.

Each week with have a philosophical / moral focus. These weekly topics have been based on the eight ethics of the *Bushido Code*: Rectitude/Justice, Courage, benevolence/mercy, Politeness, honesty /sincerity, honour, loyalty, character/self-control, as well as important life skills such as Perseverance and resilience.

The program's content will progress in a logical order. This meaning that there is reasoning behind the order in which the children are exposed to activities and techniques. They will first learn to escape (Parkour), then how to defend and evade (block attacks and escape various holds), then finally how to reciprocate violence (punch, kick etc.), should they have to. The logic behind this progression being that as a student progresses through the program, he or she will become more familiar with the philosophy and true meaning of learning martial arts. If the student already has a violent history, showing them how to hurt someone in the first class, without the reinforcement of the values and philosophies may lead to negative outcomes for that student in the playground or elsewhere. However, in order to counter the likely question “when are we going to learn how to fight?”, and develop foundational knowledge for the later lessons, some simple techniques such as the front kick, and correct punching technique will be included in earlier lessons.

In the program, the following NSW Mathematics syllabus outcomes are covered:

MA3-1WM	describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions
MA3-2WM	selects and applies appropriate problem-solving strategies, including the use of digital technologies, in undertaking investigations
MA3-3WM	gives a valid reason for supporting one possible solution over another
MA3-4NA	orders, reads and represents integers of any size and describes properties of whole numbers
MA3-5NA	selects and applies appropriate strategies for addition and subtraction with counting numbers of any size
MA3-6NA	selects and applies appropriate strategies for multiplication and division, and applies the order of operations to calculations involving more than one operation

In the program, the following NSW PDHPE syllabus outcomes are covered:

PD3-1	identifies and applies strengths and strategies to manage life changes and transitions
PD3-2	investigates information, community resources and strategies to demonstrate resilience and seek help for themselves and others
PD3-3	evaluates the impact of empathy, inclusion and respect on themselves and others
PD3-4	adapts movement skills in a variety of physical activity contexts
PD3-5	proposes, applies and assesses solutions to movement challenges
PD3-6	distinguishes contextual factors that influence health, safety, wellbeing and participation in physical activity which are controllable and uncontrollable
PD3-7	proposes and implements actions and protective strategies that promote health, safety, wellbeing and physically active spaces
PD3-8	creates and participates in physical activities to promote healthy and active lifestyles
PD3-9	applies and adapts self-management skills to respond to personal and group situations
PD3-10	selects and uses interpersonal skills to interact respectfully with others to promote inclusion and build connections
PD3-11	selects, manipulates and modifies movement skills and concepts to effectively create and perform movement sequences

In the program, the following physical martial arts techniques will be covered:

Self-Preservation	Break-Falling (Forwards and backwards)
	Forward safety roll
	Safety landing
	Balancing
Parkour	Safety Vault
	Speed vault
Self-defence (escapes from simple grabs and holds)	Wrist grab (Right hand on right wrist)
	Wrist Grab (Right hand on Left wrist)
	Wrist grab 2 hands on 1 wrist)
	Double handed lapel/shoulder grab
Dodging and evading basic attacks	Sprint
	Ducking
	Jumping
	Pivoting
Blocking and deflecting basic attacks	Shell
	Parry
	Ducking under and "Taking the back"
Basic Striking	Jab
	Cross
	Hook
	Uppercut
	Front kick
	Round kick
Basic grappling	Double leg takedown (from knees)
	Headlock throw (from knees)
	Escape from mount: *Bridge & roll*
	Guard pass: *Basic Split pass*
	Scissor sweep (from guard)
Martial Acrobatics	Jumping Front Kick
	Tornado Kick

In the program, the following character/ethics topics will be covered both explicitly and implicitly:

- Courage
- Courtesy
- Respect
- Integrity
- Concentration
- Loyalty
- Teamwork
- Honesty
- Perseverance
- Resilience
- Self-control

These topics have been chosen based on the Bushido Code - a widely known set of ethics, understood to stem from the Samurai (Cleary & Ratti, 2011) – and the text *Martial Arts Character Education Lesson Plans for Children* by Massie (2013), designed specifically to outline martial arts character education lessons plans for children. Some of the topics will be taught individually, while others will be taught in conjunction with other related topics.

Kick-Smart Pedagogy

Special Needs

The Kick-Smart intervention is designed to allow all students in mainstream Stage 3 classes to engage in each activity and perform all techniques and skills in the program. While every reasonable adjustment will be made to accommodate special needs through collaborative consultation with the class teachers, some adjustments may be unable to be achieved without compromising the quality of the activities for the other students, and may jeopardise the outcomes of the study, thus making the adjustments unreasonable.

Student Engagement

The activities in the Kick-Smart program are designed to achieve maximal engagement through the inclusion of the SAAFE Teaching Principles (Lubans et al., 2017), developed and published by the Priority Research Centre for Physical Activity and Nutrition at the University of Newcastle, in collaboration with the Institute for Positive Psychology and Education at Australian Catholic University and the Psychology of Exercise, Health and Physical Activity Laboratory at the University of British Columbia. Each lesson aims to include as many of the following SAAFE principals as possible:

1. Be SUPPORTIVE in your teaching. Take the perspective of the students, provide a rationale for what you are doing, create meaningful connections, use language that is not strict or controlling, and demonstrate emotional support or involvement. Examples: Provide individual skill specific feedback; provide praise on student effort and improvement.

2. Maximise opportunities for individuals to be physically ACTIVE by including high levels of physical activity and minimal transition time. Examples: Avoid elimination games; play multiple mini games to maximise student involvement.

3. Create an AUTONOMOUS environment by providing students with choice and offering graded tasks. Examples: Allow students to choose the music within the lesson; involve students in the modification of the activities/rules.

4. Design and deliver FAIR lessons by providing all students with opportunities to experience success in the physical domain. Examples: Ensure students are evenly matched in activities; encourage self-comparison rather than peer-comparison.

5. Provide an ENJOYABLE experience, as people tend to persist with activities they find intrinsically motivating. Examples: Start and conclude session with an enjoyable activity; do not use exercise as punishment.

Behaviour Management

Misbehaviour will be seen as any moment in time where a student is disrupting the learning of others in any way, challenging authority figures, threatening the wellbeing of others, or any combination of these behaviours. These behaviours will be discussed with the students at the beginning of the program, highlighting clear and high expectations, and noting that these behaviours are unacceptable and may result in exclusion from some activities, or possibly the program if the behaviours are severe enough.

Progression of Disciplinary Action

All students are susceptible to becoming disengaged and displaying some or all of the unacceptable behaviours mentioned above at some point. Therefore, rather than having a "Zero Tolerance" policy, the following progression will be followed when managing negative behaviour:

Step	Disrupting others	Challenging Authority	Threatening wellbeing of others (or themselves)
1	Low level intervention (i.e. "The Look", gesture to stop talking, move to the student's proximity)		
2	Gentle reminder of expectations (i.e. what the task is) and offer assistance		
3	De-escalating statement: *I'm sure your friend is interested in what you have to say, but it needs to wait until after class.*	De-escalating statement: *I'm interested in what you have to say, but now is not the best time, so let's talk about it after class.*	Due to the nature of the program, if the behaviour continues, proceed to step 4.
4	Notify the student that if the behaviour continues, they will be excluded from the current activity and will sit with the classroom teacher (and follow through)		
6	Notify the student that if the behaviour continues, they will be excluded from the remainder of the session and will sit with the classroom teacher (and follow through)		
7	If the student continues this behaviour over multiple sessions, they may be excluded from the program. What they do during this time will be at the discretion of their class teacher (i.e. sit with the teacher and watch, join a "buddy class", work in the office under executive supervision)		

PROGRAM OVERVIEW						
Week	**Lesson**	**Overview**	**Character/Ethic focus**	**Martial arts focus**	**Mathematics Outcomes**	**PDHPE Outcomes**
1	1	▪ Forward Safety roll ▪ Front break-fall ▪ Back break-fall ▪ Safety landing	Courage	Self-preservation	MA3-4NA MA3-1WM MA3-2WM	PD3-4, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11
	2	▪ Safety vault, ▪ Speed vault ▪ Balancing ▪ Obstacle course that summarises the 1st week	Respect (& Courtesy)	Parkour	MA3-6NA MA3-1WM MA3-3WM	PD3-3, PD3-4, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11
2	3	Escaping simple grabs and holds, such as: ▪ Wrist grab (attacker's right hand grabs right arm) ▪ Double wrist grab (attacker grabs both wrists with both hands) ▪ Double handed wrist grab (attacker grabs wrist with both hands) ▪ Escape from double handed lapel grab/choke/hands on shoulders	Integrity	Self-defence	MA3-6NA MA3-5NA MA3-2WM	PD3-1, PD3-3, PD3-4, PD3-5, PD3-7, PD3-8, PD3-9, PD3-10
	4	▪ Duck under an attack (e.g. a punch or a "weapon" [pool noodle or padded stick]) ▪ Jump over an attack to the legs (e.g. a "weapon" [pool noodle or padded stick]) ▪ Pivot out of the way of a vertical (down) strike ▪ "Shell" Basic head protection Parry cross punch		Evading & dodging basic attacks	MA3-2WM MA3-1WM MA3-6NA	PD3-1, PD3-3, PD3-4, PD3-7, PD3-8, PD3-9, PD3-11
3	5	▪ Lunge ▪ Shuffle forward ▪ Shuffle back ▪ Switch stance ▪ Pivot	Self-Control (& Concentration)	Blocking/ deflecting/ dodging basic attacks	MA3-1WM MA3-5NA MA3-6NA	PD3-2, PD3-3, PD3-4, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11
	6	▪ Jab ▪ Cross ▪ Uppercut ▪ Hook		Striking (with hands)	MA3-1WM MA3-2WM MA3-5NA MA3-6NA	PD3-2, PD3-3, PD3-4, PD3-5, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11
4	7	▪ Front Kick ▪ Round Kick ▪ Knee	Loyalty (& Teamwork)	Striking (with legs)	MA3-1WM MA3-2WM MA3-6NA	PD3-3, PD3-4, PD3-8, PD3-9, PD3-10, PD3-11

	8	Team building and trust exercises/games
		• Beanbag "wars"
		  ○ 3 games. 1st one is simply played. The final 2, chn. Are given 1 min to discuss strategies to be more efficient
		• Partner counter-balances
		• Team balances/lifts
		• Create origami ninja stars – One set of instructions per team of 3-5
		  ○ Use ninja stars with numbered ground targets for (+/-/÷/x) game
		• Tug of War
				Teamwork	MA3-1WM
					MA3-3WM
					MA3-5NA
					MA3-6NA
						PD3-4, PD3-5, PD3-6, PD3-7, PD3-8, PD3-9, PD3-10

5	9	Lesson one - Wrestling/Grappling basics ▪ Escape mount – bridge and roll	Honesty	Wrestling/Grappling	MA3-1WM MA3-6NA	PD3-3, PD3-4, PD3-5, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11

		▪ Transition from guard (bottom) to mount (either scissor sweep or hip bump/sit up sweep) ▪ Pass guard (dig elbows in and step over) ▪ Double leg takedown ▪ Arm bar from mount ▪ Live drills				
	10	Lesson two – Wrestling/grappling basics ▪ Escape mount – bridge and roll ▪ Transition from guard (bottom) to mount (either "scissor sweep" or "hip bump"/"sit up" sweep) ▪ Pass guard (dig elbows in and step over) ▪ Double leg takedown ▪ Arm bar from mount ▪ Wrestling game: 5 second pins		Wrestling/Grappling	MA3-1WM MA3-6NA	PD3-3, PD3-4, PD3-5, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11
6	11	Lesson 1 – MMA Lesson ▪ Striking combination > takedown > ground position > escape	Perseverance (& Resilience)	Mixed Martial Arts	MA3-1WM MA3-2WM MA3-3WM MA3-5NA	PD3-2, PD3-4, PD3-5, PD3-8, PD3-9, PD3-10, PD3-11
	12	Lesson 2 • Jumping front kick ▪ Tornado kick ▪ Butterfly kick ▪ "Drop kick" (on crash mat)		Martial Acrobatics	MA3-1WM MA3-5NA	PD3-2, PD3-4, PD3-8, PD3-9, PD3-10, PD3-11

Week One		
Lesson 1 – Introduction to MMA Program		
Lesson Objective(s): • Introduce students to the program in a positive, energetic and inspiring way • Teach the self-preservation techniques that will be used throughout the program • Introduce bowing at the beginning and end of lessons • Define "Courage"	**Mathematics Outcomes:** MA3-4NA MA3-1WM MA3-2WM	**PDHPE Outcomes** PD3-4, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11

	Time	**Resources:**	
Orientation: • Introduce instructor(s) and course • Display "Courage" slide on the projector screen and quickly discuss the definition: Not the absence of fear, but going on in spite of it.	2	Projector + Screen	1
		Computer with internet access	1
		Gymnastics padded wedge	1
		Mini Hurdles	10
Warm up: Play *Number Up* – See Appendix 1 (MA3-6NA, MA3-1WM, MA3-3WM)	5	3cm x 1m x 1m Matted floor (≈36m²)	1
		Mini-Trampoline	1-2
		Gymnastics crash mat	2

Content	**Time**	**Guided Discovery**	**Group Structure**	**Martial Arts Outcomes / KTP's**	**Maths Outcomes**	**PDHPE Outcomes**
Front Break falls (Appendix 2)	8	Demonstrate technique and have several practice attempts from knees	Whole group (WG) "Copy me"	Effective break-fall: • Chest and belly don't bang on ground • Head stays off ground and turns to the side • Lands on both forearms, with arms bent, not straight.		PD3-4 PD3-10
		One minute rotations 1) practice doing front break-falls on the padded floor as a Mexican wave in a circle 2) Practice the technique by jumping as high as they wish onto a crash mat (using mini-tramp depending on ability) 3) Practice the technique (vertically) by running at a crash mat that is up against a *sturdy* wall (one at a time)	SG 5-7			
Backwards Break-falls	8	Demonstrate technique and have several practice attempts from knees	WG "Copy me"	Effective break-fall:		PD3-4 PD3-8

(Appendix 2)		One minute rotations 1) Practice the technique on the padded floor as a Mexican wave in a circle 2) Practice the technique (vertically) by running at a crash mat that is up against a *sturdy* wall (one at a time) 3) *Ninja, Ninja, Samurai*. Using the same rules as duck, duck goose, In groups of 5-6, Students sit on bottoms, with legs facing the centre of the circle. If they are chosen to be a Ninja, they must do a backwards break-fall and sit back up. If they are chosen to be a Samurai, they must chase the person who is in around the circle and tip them before they reach the original spot.	SG 5-7	• Bends legs and lower's him/herself down onto their bottom • Chin tucked in to chest • Head doesn't hit the ground • Arms go out to each side to prevent rolling over.		PD3-10
Forward Safety Rolls (Appendix 3)	4	Demonstrate technique and have several practice attempts from knees and crouching position.	WG "Copy me"	Safe Roll • Tucks chin in to chest • Rolls over shoulder, not neck. • Travels in a (roughly) forward direction.		PD3-4 PD3-8 PD3-9 PD3-10
	6	Circuit: 1) Log rolls 2) "Elephant Crawl". Crawling on hands and knees, count every step, and on every "step" that is a multiple of 3 (3, 6, 9, etc.) tuck chin in, reach arm underneath body touch opposite shin, putting shoulder on ground. Place arm back in front and continue crawling. 3) Back break-fall get-ups. Perform a back break-fall, then as feet go back towards the ground, tuck one underneath bottom and stretch the other one forward. Transfer weight onto the foot underneath and the hand on the same side. Reach the other hand forward over the knee that is forward and stand up. Take a step forward and begin the process again. 4) Forward safety roll down the gymnastics ramp 5) Forward safety roll on the padded floor and join the end of the line	SG 5-7			

<table>
<tr><td></td><td>5</td><td>Working with a teacher, the group sits in a circle. Scatter numbered objects in the centre. Students take turns forwards or backwards rolling to the applicable object when the scenario is given.
• What is one factor of 40? Repeat this question but change the number e.g. 75, 16, 84 etc.
• Show me a factor of 24, and then roll to the pair of the factor
• Find multiples of the number 3.
Find a prime number.</td><td></td><td></td><td></td><td></td></tr>
<tr><th colspan="7">Mat Chat</th></tr>
<tr><td colspan="6">Courage discussion
1. Ask students to recall the definition of courage, or to make up their own.
2. Ask the question: Does courage mean you are not afraid of anything? (Assume many will answer yes, which is incorrect).
3. "Now we're going to explain why having real courage means you do brave things, even when you're afraid. Isn't everyone afraid of something? Sure they are! It's part of being a regular person. Now who could give me an example of someone who does brave things? (Students give examples such as police officers, firefighters, soldiers). Do you think a firefighters aren't afraid of going into a burning building to save people? Of course they are, but they do it anyway because it is important."
4. "What is something that make you afraid but you have to do anyway? Maybe give a speech in front of the class, or perhaps even joining in today with some of the activities, but you did it anyway, because it was important. That sounds like courage to me."
5. "There is a difference between being brave and being foolish. Being brave is doing something you are afraid to do, because it is...Important. Being foolish is doing something like jumping off a roof because someone dared you to, or said they would call you chicken if you didn't. So remember, courage isn't doing something for a dare that could get you hurt, it is doing something that you are afraid of because it is important."
6. Meditation (1 minute sitting on knees or with crossed legs [with good posture and eyes closed])</td><td>PDHPE Outcomes
PD3-7
PD3-9
PD-10</td></tr>
</table>

For teaching points, diagrams and reasoning for safety landing, break-falls and rolls, see the following two sources:

http://www.martialartsjudo.com/breakfalls.php

http://www.humankinetics.com/excerpts/excerpts/landing-and-falling-important-skills-for-youth-gymnastics

NOTE: The forward safety roll is <u>different</u> to a forward roll (AKA "Somersault"). The student's head is never directly under their body. The safety roll is asymmetrical. You roll across your back along a diagonal, from shoulder to the opposite hip, so that your feet strike the ground one at a time.

<table>
<tr><td colspan="7" align="center">Week One</td></tr>
<tr><td colspan="7" align="center">Lesson 2 – Parkour</td></tr>
<tr><td colspan="3">Lesson Objective(s):
• Introduce word of the day:
• Revise some of the techniques from previous lesson
• Teach simple Parkour techniques</td><td colspan="2">Mathematics Outcomes:
MA3-6NA, MA3-1WM, MA3-3WM</td><td colspan="2">PDHPE Outcomes:
PD3-3, PD3-4, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11</td></tr>
<tr><td colspan="2">Orientation:</td><td>Time</td><td colspan="4" align="center">Resources:</td></tr>
<tr><td colspan="2" rowspan="4">• Display "Respect" slide on the projector screen and quickly discuss the definition: "Esteem" – Give it to others, earn it for yourself.
• Note that the students must respect the rules and equipment. Not to use the equipment, or perform any techniques or skills unless instructed to do so.</td><td rowspan="4">2</td><td colspan="3">Projector + Screen</td><td>1</td></tr>
<tr><td colspan="3">Computer with internet access</td><td>1</td></tr>
<tr><td colspan="3">5x jumbo dice, 5x 10 side dice</td><td>10</td></tr>
<tr><td colspan="3">Mini Hurdles</td><td>10</td></tr>
<tr><td colspan="2" rowspan="4">Warm up:
Play Number Up – See Appendix 1
(MA3-6NA, MA3-1WM, MA3-3WM)</td><td rowspan="4">5</td><td colspan="3">3cm x 1m x 1m Matted floor (≈36m^2)</td><td>1</td></tr>
<tr><td colspan="3">Mini-Trampoline</td><td>1-2</td></tr>
<tr><td colspan="3">Vault obstacles</td><td>2-5</td></tr>
<tr><td colspan="3">Gymnastics crash mat</td><td>2</td></tr>
<tr><th>Content</th><th>Time</th><th>Guided Discovery</th><th>Group Structure</th><th>Martial Arts Outcomes / KTP's</th><th>Maths Outcomes</th><th>PDHPE Outcomes</th></tr>
<tr><td>Safety Landing</td><td>10</td><td>Students are show Motorbike landing position, and practice several from a standing jump. Then begin the circuit:
1. Agility Ladder (double footed jump)
2. Mini Hurdles (double footed jump)
3. Agility Ladder (double footed jump)
4. Jump off gymnastics box, onto crash mat (motorbike position)
5. Mini Hurdles (double footed jump)
6. Agility Ladder (double footed jump)
7. Mini Tramp to motorbike landing

Students roll a large 6-sided die before they begin their circuit. The number rolled is what they count up by every time they perform a movement/jump in the circuit.</td><td>WG</td><td>Lands with:
• Knees slightly bent to absorb the impact of landing
• No straight legs on the landing
• No squat position on the landing
• Straight spine to keep the neck stable and prevent falling forward
• No arch in the lower back
• No bending forward at the waist
Arms extended to the front, straight and level</td><td>MA3-6NA</td><td>PD3-4
PD3-8
PD3-9
PD3-10
PD3-11</td></tr>
</table>

				with the heart in order to keep chest up on the landing		
Safety Vault Safety Vault	10	Students are show the technique and practice with teacher on ground, then in small groups: 1. Mini tramp vault (Teacher guided) – Remove vault and do safety landing if student uncomfortable with height. They may choose to make a shape in the air e.g. a star jump before landing. 2. Safety vault over low balance beam / bench 3. Vault over gymnastics box/Solid crash mat 4. Ninja, Ninja, Samurai 5. Practice Safety LANDING over mini hurdles Each time one of the team members performs the vault, they count by a determined number (e.g. 4's). Once the 1.5minute interval finishes, they roll a 10 sided die and divide their score by the number rolled. • Provide a whiteboard at each station, for groups to use if needed.	SG (4-5)	See Appendix 4	MA3-6NA	PD3-4 PD3-8 PD3-9 PD3-10 PD3-11

Speed Vault	10	Speed Vault The instructor demonstrates the technique, gives step by step instructions, checks for understanding. Repeat Rotations from Safety vault, but students may now chose to perform a speed vault instead of safety vault.	WG SG (4-7)	See Appendix 5	MA3-6NA	PD3-4 PD3-8 PD3-9 PD3-10 PD3-11

Activity Circuit	10	Students complete the following circuit: 1. Elephant walk 2. Front break-falls (or backwards) 3. Safety/Speed Vault over low beam 4. Rolls (shoulder/pencil) 5. Mini Hurdles (double footed jump) 6. Agility Ladder (double footed jump) 7. Sprint 8. Mini Tramp Safety/Speed vault	SG (3-5)	See previous outcomes for: • Safety vault • Speed vault • Safety landing • Back break-fall • Forward break-fall		PD3-4 PD3-8 PD3-9 PD3-10 PD3-11

Mat Chat	
Respect discussion	**PDHPE Outcomes**
1. Ask students to recall the definition of Respect, or to make up their own. 2. Esteem – Treating someone with extra courtesy. 3. Self-esteem means feeling good about yourself, so esteem for others means you look up to them. So who are some of the people we should give respect, this extra-special courtesy, to? Parents, teachers, martial arts instructors, police, adults in general 4. Now, let's talk about why respect is important. Think about it like this: Your parents, your teachers, they both spend a lot of their time and effort taking care of you, keeping you safe, teaching you new things, organising cool martial arts teachers to come and teach you. Showing respect is an easy way to show that you appreciate that. And the best thing is, you can do it every day, and a lot of you probably already do. 5. So what are some things we can do to show respect? (allow time for children to answer) 6. Meditation (1 minute sitting on knees or with crossed legs [with good posture and eyes closed])	PD3-3 PD3-7 PD3-10

Week 2		
Lesson 3 – Self Defence		
Lesson Objective(s): • Integrity • Self Defence	**Mathematics Outcomes:** MA3-6NA, MA3-5NA, MA3-2WM	**PDHPE Outcomes:** PD3-1, PD3-3, PD3-4, PD3-5, PD3-7, PD3-8, PD3-9, PD3-10

	Time	Resources:	
Orientation: • Introduce topic of the day • Introduce word of the week: **Integrity**	2	Projector + Screen	1
		Computer with internet access	1
		3cm x 1m x 1m Matted floor (≈36m²)	1
Warm up: Warm up game from Appendix 1	5	20m² area (Can use regular training area [≈36m²])	1

Content	Time	Guided Discovery	Group Structure	Martial Arts Outcomes / KTP's	Maths Outcomes	PDHPE Outcomes
Wrist grab (attacker's right hand grabs right arm)	1	Demonstrate technique to class	Pairs	Demonstrates the following to escape a wrist grab: • Circles own arm in a clockwise direction until own hand is on top • Uses both hands to push attackers hand away	MA3-6NA MA3-5NA MA3-2WM	PD3-3 PD3-4 PD3-5 PD3-8 PD3-10
	5	"Attacker" grabs the "defender" and asks a simple addition, subtraction, multiplication or division question. The "Defender" answers the question, then performs the technique to escape the grab. The roles are then reversed				
	1	Demonstrate technique to class	WG		MA3-6NA	PD3-3

Wrist grab (attacker grabs right wrist with left hand)	6	Split class in half. One half are "Attackers", the other half are "defenders". Students skip/jump/lunge around the designated area randomly until the instructor shouts danger. "Attackers" grab the closest "defender" in a double wrist grab. The instructor shouts out a simple addition, subtraction, multiplication or division question. The "Defenders" performs the technique to escape the grab (which also allows time to process the question) then answers the question. After 2 minutes, the roles are then reversed. At this time, revise teaching points of technique.		Demonstrates the following to escape a wrist grab: • Circles own arm in an anti-clockwise direction and performs an arm curl • Grabs own (right) hand with free hand and pulls arm away, and back towards left shoulder	MA3-5NA MA3-2WM	PD3-4 PD3-5 PD3-8 PD3-10
Double handed wrist grab (attacker grabs *one* wrist with *both* hands)	1	Demonstrate technique to class	Pairs	Demonstrates the following to escape a double-handed wrist grab: • Quickly drops into a squat while pretending to hammer a nail into the ground with trapped hand • Uses free hand to grab trapped hand and pull up and backwards – "Pull the rabbit out of the hat"		PD3-3 PD3-4 PD3-5 PD3-8 PD3-10
	7	Perform escape and shuttle run to the other side of the room and back 10x, then reverse rolls.				
	1	Demonstrate technique to class	WG			PD3-3

Escape from double handed lapel grab/choke/hands on shoulders	7	Perform escape and shuttle run to the other side of the room and back 10x, then reverse rolls. If working in trios: Two students stand on opposite sides of the space. Other student escapes from one of them, then runs to the other side and performs the escape on the student on the other side.	Pairs Or Trios	Demonstrates the following to escape a double-handed shoulder area grab: • Uses left hand to trap attacker's right hand by applying pressure to the top of their hand. • Raises right arm straight up in the air and sticks shoulder to own ear • Steps back with left foot while twisting to the left • Pushes attacker back, then runs in opposite direction		PD3-4 PD3-5 PD3-8 PD3-10
Combine all of the techniques		Split class in half. One half are "Attackers", the other half are "defenders". Students skip/jump/lunge around the designated area randomly until the instructor shouts danger. "Attackers" grab the closest "defender" in a double wrist grab. The instructor shouts out a simple addition, subtraction, multiplication or division question. The "Defenders" performs the technique to escape the grab (which also allows time to process the question) then answers the question. After 2 minutes, the roles are then reversed. At this time, revise teaching points of technique.	WG	See outcomes for previous techniques	MA3-6NA MA3-5NA MA3-2WM	PD3-3 PD3-4 PD3-5 PD3-8 PD3-10

Mat Chat	
<u>Integrity discussion</u> 1. Ask students to recall the definition of Integrity, or to make up their own. 2. Integrity: the quality of being honest and having strong moral principles. *Undivided; consistent; sincerity* 3. Character means what type of person you are. Whether you are a good person or bad person, trustworthy or untrustworthy. SO integrity means you are basically an all-round good person. Those key words: *Consistent* and *undivided* are also really important. Why is that do you think? 4. Because someone with a lot of integrity is a good person all the time, no matter what others say or do, (in other words, they are consistently good, even when people try and divide them from their good choices and make bad ones. People with integrity would rather tell the truth and face any consequences, than lie. 5. Who can finish this sentence? *"Actions speak louder than [words]"*-What do you think that means? 6. It means you can't always tell what kind of person someone is by what they say, but you can tell that by what they do. 7. If a person doesn't have integrity, they would say one thing, and do another. For example, tell you that they are your friend, then go off and tell their other friends that they don't like you. Who could think of another example? 8. Meditation (1 minute sitting on knees or with crossed legs [with good posture and eyes closed])	**PDHPE Outcomes** PD3-1 PD3-3 PD3-7 PD3-9

Week 2		
Lesson 4 –Evading / dodging basic attacks		
Lesson Objective(s): • Integrity • Blocking/ deflecting/ dodging basic attacks	**Mathematics Outcomes:** MA3-2WM, MA3-1WM, MA3-6NA	**PDHPE Outcomes:** PD3-1, PD3-3, PD3-4, PD3-7, PD3-8, PD3-9, PD3-11

	Time
Orientation: • Revise definition of Integrity: • The quality of being honest and having strong moral principles. *Undivided; consistent; sincerity* • Quickly outline lesson: Today we are learning how to dodge attacks. In other words, we are learning how *not* to get hit.	2
Warm up: Choose from *Numeracy-Based Warm up games* section	5

Resources:	
Projector + Screen	1
Computer with internet access	1
Tennis Balls	7
Chairs	7
Flexi Domes	15-20
Padded swords / ½ pool noodles	13
Pool Noodle	2-3
Extra-Large skipping rope	1
3cm x 1m x 1m Matted floor (=36m²)	1
Mini-Whiteboards	13
Whiteboard Markers	13

Content	Time	Guided Discovery	Group Structure	Martial Arts Outcomes / KTP's	Maths Outcomes	PDHPE Outcomes
Moving forward quickly (Sprint)	1	Demonstrate correct technique and outline FMS points for sprinting. (See appendix 6)	WG	• Lands on ball of the foot. • Non-support knee bends at least 90 degrees during the recovery phase. • High knee lift (thigh almost parallel to the ground). • Head and trunk stable, eyes focused forward. • Elbows bent at 90 degrees.		PD3-4 PD3-8 PD3-11
	5	Ball drop challenge. Stand on a chair. Hold arm straight out and drop tennis ball. Student must stand 3m away. When they see the ball drop, they run and try to catch it either before it hits the ground, or after the first bounce.	SG			

				• Arms drive forward and back in opposition to the legs.		
Ducking and jumping	2	Demonstrate the correct technique for ducking under (appendix 7) and jumping over (Appendix 8) an on-coming object/attack	WG	Duck: • Appendix 6 Jump: • Get ready: "Arms back, crouch forward" • Take Off: "Spring and swing your arms" • Fly: "Knees up, look forward" • Land: "Land quietly, arms forward"	MA3-2WM MA3-1WM MA3-6NA	PD3-4 PD3-8
	7	The Clothesline: The instructor and an assistant hold onto a long skipping rope and stretch it at shoulder height. The class stands in the centre of the area. The rope holders then walk/run on each side of the class with the rope, making the class duck underneath using the correct technique. The instructor counts how many students touch the rope and multiplies it by a number. The instructor gives the class the class the product, and the multiple. The class must work out the number of students while doing squats. When the instructor says "GO!" the students perform their answer in push-ups. E.g. The instructor feels 5 students touch the rope. He then gives the class the product (30), and the multiple (6). The class then does 5 push-ups. The Whipper-snipper: The instructor and an assistant hold onto a long skipping rope and stretch it at ankle height. The class stands in the centre of the area. The rope holders then walk/run on each side of the class with the rope, making the class jump over it using a tuck jump. The same maths problem as the Clothesline is given.	WG			

	7	Jumping races Using kick shields or mini hurdles, each group lines up at a set of hurdles. The instructor gives a number by which they have to count (7), and a target multiple that they have to reach (63). Every time a student reaches the end of the hurdles, runs back and high-fives the next team mate, that is worth one of whatever number is chosen (7). As soon as the team reaches the goal (63), they sit down in a straight line with their legs crossed. The other teams perform 10 push-ups and the game begins again with a new number and new target (e.g. Counting by sixes, and the target is 72). The instructor should emphasise following instructions by only awarding a win to the first group to be finished that has all students following both instructions: 1. Sit down with legs crossed 2. Straight line	SG	• Get ready: "Arms back, crouch forward" • Take Off: "Spring and swing your arms" • Fly: "Knees up, look forward" • Land: "Land quietly, arms forward"	MA3-2WM MA3-1WM MA3-6NA	PD3-4 PD3-8
Pivoting and stepping	1	Demonstrate technique	WG	• Turn hips as leg moves back (e.g. Left hip goes to the back as the left foot goes back) • Hands are up in a defensive position. • Don't move until you see your partner "attack"	MA3-2WM MA3-1WM MA3-6NA	PD3-4 PD3-8
	6	Noodle chasing: One student has a noodle, and the other student faces them in their fighting stance. The student with the noodle attempts to tap their partner's closest foot. The partner without the noodle must evade the noodle by stepping back and pivoting. This process repeats until the pair reaches the end of the mat. The pair then rolls a die and multiplies the number rolled by the number of times the person got tagged. The roles are then reversed.	Pairs			

Putting it all together + dodging	6	The blind monk: 1-3 people are blindfolded and given a pool noodle. They are to walk around the area(s) performing either a head height horizontal swing, an ankle height horizontal swing, or a vertical strike from head height to knee height. The other students must evade using the techniques learnt throughout the class. Several students take it in turns of being the monk(s) NOTES: • Emphasise control of noodle. Any wild or excessive swings will result in a 20 second time out, and a change-over of monks. • Make sure students and teacher alert "monk" if they are going out of the area of play	WG	Dodging: • Look straight ahead (at opponent) • Use outside of foot • Lower body weight, then up when changing direction • Use knees • Use only one step to change direction		PD3-4 PD3-8 PD3-11

Mat Chat (10 Mins)	
Integrity discussion	**PDHPE Outcomes**
1. Ask students to recall the definition of Integrity, or to make up their own. 2. Integrity: the quality of being honest and having strong moral principles. *Undivided; consistent; sincerity* 3. Okay, so we know that we want to have integrity, because we all want to be good people. We also want to be someone that others can respect and look up to. But the truth is that no one other than *you* can make yourself a person of integrity. Remember it's not what you do when people are watching, it's about what you do *all* the time, even when people aren't watching that makes you a person of integrity. 4. Some people only do the right thing because they are afraid of getting caught doing the wrong thing. Others are selfish and always put their own needs in front of others. But some people know what is right, and choose to do that, even if it isn't the best thing for them personally, and they even do it when no one is around. That is real integrity. 5. So I want you to spend some time this week thinking about your actions and whether you have been acting with integrity. IF you know you haven't been, I want you to put an effort in to act with integrity, and make some choices that you know are good. I want you to do this even if no one notices. The most important person will notice those actions, and that person is....? (YOU) 6. Meditation (1 minute sitting on knees or with crossed legs [with good posture and eyes closed])	PD3-1 PD3-3 PD3-7 PD3-9

Week Three		
Lesson 5 – Blocking & deflecting basic attacks		
Lesson Objective(s): • Self control / concentration • Blocking/ deflecting/ dodging basic attacks	**Mathematics Outcomes:** MA3-1WM, MA3-5NA, MA3-6NA	**PDHPE Outcomes:** PD3-2, PD3-3, PD3-4, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11

Orientation:	Time	Resources:	
• Introduce self-control. Briefly discuss what it is: The ability to control yourself; Choosing the right actions, especially in difficult situations. • Briefly outline the content of today's lesson: Learning how to block and deflect strikes	5	Projector + Screen	1
		Computer with internet access	1
		Focus Mitt (pair)	13
		Bag Gloves (pair)	13
Warm up: Choose 1 activity from Appendix 1	5	3cm x 1m x 1m Matted floor (≈36m²)	1
		Padded swords / ½ pool noodles	13

Content	Time	Guided Discovery	Group Structure	Martial Arts Outcomes / KTP's	Maths Outcomes	PDHPE Outcomes
Shell	5	Demonstrate technique (Appendix 9)	WG	• Learn to block ○ Move *with* the strike, not against. ○ "Imagine you are rubbing hair gel through your hair"	MA3-1WM MA3-6NA	PD3-4 PD3-7 PD3-8
	5	Recall multiplication facts while practicing technique E.g. Every time the partner touches their "shell", they "roll with the punch" and recall a number fact. E.g Counting by 4's.	Pairs			
Aeroplane to back	5	Demonstrate technique	WG	• Learn to Duck under a strike ○ Maintain sight of opponent ○ Keep hands up ○ Step forward on 45° angle under the outstretched arm	MA3-1WM MA3-5NA	PD3-4 PD3-7 PD3-8 PD3-11
	10	Students perform technique on their opponent coming towards them. Once they are behind the opponent, they bear hug them and ask their partner an addition or subtraction question. Students are held for 10 seconds while they try to answer the question. If the student answers correctly, they are released early. Students switch roles every time. Swap Aeroplane movement to a <u>*slow*</u> "Haymaker" style punch Students perform technique on their opponent coming towards them. Once they are behind the opponent, they push	pairs			

<table>
<tr><td></td><td></td><td>their opponent away and sprint to the other side of the space. This time, they are going for speed, and will not be doing mathematics questions.</td><td></td><td>○ Hug opponent around waist as you pass under the arm</td><td></td><td></td></tr>
<tr><td>Duck, Pivot or jump</td><td>10</td><td>In pairs students take it in turns to make their partner:
Jump (by swinging the pool noodle ankle height)
Duck (swinging pool noodle at head height), or
Pivot (bringing the pool noodle down the centre of their partner)
Students may wish to attempt to add in the "duck under to back" technique when they duck if they would like a challenge</td><td>Pairs</td><td>• Apply both techniques</td><td></td><td>PD3-4
PD3-7
PD3-8
PD3-11</td></tr>
<tr><td colspan="7">Mat Chat</td></tr>
<tr><td colspan="6"><u>Self-Control Discussion</u></td><td>PDHPE Outcomes</td></tr>
<tr><td colspan="6">1. Ask students to recall the definition of Self-Control, or to make up their own.
2. Self-Control: The ability to control yourself; Choosing the right actions, especially in difficult situations.
3. So that means choosing the right thing to do, and doing it, even when you don't want to.
4. Put your hand up if you have ever been so mad that you have wanted to scream, or break something? Pretty much everyone, right? Because everyone gets angry. But what kind of world would it be if everyone acted on their anger? A pretty scary and dangerous one, full of people fighting, screaming and breaking things all the time.
5. So let's put this in real terms. Self-control means controlling what you say and do, so it's really important. Because no one wants to live in that scary world we just spoke about. So what is something you can do to show self-control when you are mad and want to scream, break something, or hurt someone? (Kids list strategies they know, e.g. Close eyes, deep breath and count to 10)
6. Meditation (1 minute sitting on knees or with crossed legs [with good posture and eyes closed])
While you get yourself comfortable and begin to close your eyes, I want you to control your breathing. You are the only one in the world who can do this. Only you are in charge of your breathing. Slow your breathing down now. In through your nose, Imagining you are filling your belly with air. Out through your mouth, emptying your lungs completely. Right now, you are showing self-control. You are in charge of this. Again, slowly in through your nose, and out through your mouth. Think about what you can achieve when you show self-control. Think about how it would feel to control your behaviour and emotions for so long that you achieve your goal. Maybe you have sat down at home or in the library, and finished a poster or project from school. It's perfect. It is exactly the way you want it to be. You show it to your friends and teacher and they love it. How do you feel? Maybe you feel happy, maybe you feel like something heavy has been taken off your chest and you feel lighter and more relaxed.</td><td>PD3-2
PD3-3
PD3-7
PD3-9
PD3-10</td></tr>
</table>

<table>
<tr><td colspan="8">Week Three</td></tr>
<tr><td colspan="8">Lesson 6 – Striking with hands</td></tr>
<tr><td colspan="4">Lesson Objective(s):
• Self-control / concentration
• Striking with hands</td><td colspan="2">Mathematics Outcomes:
MA3-1WM, MA3-2WM, MA3-5NA, MA3-6NA</td><td colspan="2">PDHPE Outcomes:
PD3-2, PD3-3, PD3-4, PD3-5, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11</td></tr>
<tr><td colspan="3">Orientation:</td><td>Time</td><td colspan="4">Resources:</td></tr>
<tr><td colspan="3" rowspan="4">• Recap self-control. Briefly discuss what it is: The ability to control yourself; Choosing the right actions, especially in difficult situations.
• Briefly outline the content of today's lesson: Learning how to strike with hands
• Show how to make a fist correctly</td><td rowspan="4">5</td><td colspan="3">Projector + Screen</td><td>1</td></tr>
<tr><td colspan="3">Computer with internet access</td><td>1</td></tr>
<tr><td colspan="3">Focus Mitt (pair)</td><td>13</td></tr>
<tr><td colspan="3">Bag Gloves (pair)</td><td>13</td></tr>
<tr><td colspan="3" rowspan="5">Warm up:
Choose warm up activity from Appendix 1</td><td rowspan="5">5</td><td colspan="3">3cm x 1m x 1m Matted floor (≈36m^2)</td><td>1</td></tr>
<tr><td colspan="3">Skipping ropes</td><td>10</td></tr>
<tr><td colspan="3">Clean medium length socks</td><td>10</td></tr>
<tr><td colspan="3">10 sided die</td><td>10</td></tr>
<tr><td colspan="3">Agility ladder</td><td>1</td></tr>
<tr><td>Content</td><td>Time</td><td colspan="2">Guided Discovery</td><td>Group Structure</td><td>Martial Arts Outcomes / KTP's</td><td>Maths Outcomes</td><td>PDHPE Outcomes</td></tr>
<tr><td rowspan="2">Basic Punches</td><td rowspan="2">10</td><td colspan="2">Jab, Cross, Uppercut, Hook
Demonstrate the correct punching technique (including correct way to make a fist) for each of the punches above, as the students perform the punches with the teacher.
See appendix 10</td><td rowspan="2">WG</td><td rowspan="2">• Learn the 4 basic punches
○ Jab
○ Cross
○ Uppercut
○ Hook</td><td rowspan="2">MA3-5NA</td><td rowspan="2">PD3-4
PD3-8
PD3-11</td></tr>
<tr><td colspan="2">Shadow boxing drills:
Assign a number to each punch (Jab=1, Cross=2, Uppercut=3, Hook=4)
Students line up in rows, facing the teacher. Teacher calls out a number sequence using the numbers 1-4. The students then perform that combination</td></tr>
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	10	**Focus Pad Addition**
		The teacher says that the punches still hold the same number value as the game previously. The teacher will call out a number between 1 and 20. The pairs are then given time to create a combination of punches (of their own choice) that adds up to the given number.
		
		After the students are given ample time to create a combination, ask several pairs if they would like to demonstrate the combination the created.
		
		Repeat this process several times, then the students switch roles (one student holds the focus pads, the other puts gloves on and perform the punches)
			Pairs	• Learn the 4 basic punches
				  ○ Jab
				  ○ Cross
				  ○ Uppercut
				• Ensure students keep hands up next to cheeks when punching
					MA3-1WM
					MA3-2WM
					MA3-5NA
						PD3-4
						PD3-8
						PD3-10
						PD3-11

	10	**Focus pad multiplication**
		Students are given a 10 sided die, focus mitts and boxing gloves. The pair rolls their die and remembers their number. The teacher calls out a punch (Cross punches, uppercuts or hooks). Once the students have all got their punch instruction, and their number from their die (e.g. 5), the teacher will say "Go", or blow a whistle to indicate the beginning of the round. For the next minute, the pair will count up by their number with every punch they perform.
		With a 30 second rest in between, this process repeats 2 more times. Each time, the students roll their die for a new number.
		
		After the 3 rounds have been completed, the students switch roles with their partner and the activity repeats.
			Pairs	• Learn the 4 basic punches
				  ○ Jab
				  ○ Cross
				  ○ Uppercut
				Ensure students keep hands up next to cheeks when punching
					MA3-1WM
					MA3-6NA
						PD3-4
						PD3-8
						PD3-10

	10	**Circuit** Skipping: Perform 8 rope jumps, then roll a die and multiply the number of jumps by the number rolled. Agility ladder: Perform one Push up, then immediately go through the agility ladder without touching the ladder itself. If the ladder is touched, perform 5 star jumps and join back in to the line. The sock game: In pairs, or trios, each student puts a (clean) sock in the back of their collar. The two goals are: 1) Keep their sock in their collar 2) Steal their partner's sock. If a student steals a sock, they throw it on the floor. The other student performs 2x squats, pick up their sock and restart. Squat 'n' Roll The group of students share one large 6 sided die. They roll it once to get their number. When the timer starts, in their own time, they perform: 4 punches 2 squats 1 "boxer roll" (From a standing position, roll backwards onto shoulders on a mat and then roll back up and stand up. The trick is to roll onto one knee first before standing up) For every "boxer roll" performed, the student counts up by the number that is rolled. One legged push game In pairs, students stand on one foot facing their partner. They have their hands out as if they are giving each other a "high ten" at shoulder height. They each push on their opponent's hands. If their opponent's other foot has to touch the ground, or they have to hop around to stabilize themselves, they must perform two lunges and restart the game.	SG		MA3-6NA	PD3-4 PD3-5 PD3-8 PD3-10 PD3-11

Mat Chat	
Self-Control Discussion	PDHPE Outcomes
1. Ask students to recall the definition of Self-Control, or to make up their own. 2. Self-Control: The ability to control yourself; choosing the right actions, especially in difficult situations. 3. So we all know what self-control is now. Let's talk about the benefits of it. 4. What is so good about self-control? What is something positive you can do with self-control? (Students give answers) E.g. concentrate in class, which helps you learn important things; get tasks done, even when they're boring; control your temper and avoid bad situations like fights; keep your body healthy by choosing good foods over bad foods. 5. Can anyone give an example of a time at school or at home where you might need to have self-control? (During tests and exams; at parties when there are lots of lollies to eat; when someone is making you mad; when you have homework, or something important to do and someone offers for you to do something more fun with them instead) 6. Meditation (1.5 minutes sitting on knees or with crossed legs [with good posture and eyes closed]) While you get yourself comfortable and begin to close your eyes, I want you to control your breathing. You are the only one in the world who can do this. Only you are in charge of your breathing. Slow your breathing down now. In through your nose, Imagining you are filling your belly with air. Out through your mouth, emptying your lungs completely. Right now, you are showing self-control. You are in charge of this. Again, slowly in through your nose, and out through your mouth. Think about what you can achieve when you show self-control. Think about how it would feel to control your behaviour and emotions for so long that you achieve your goal. Maybe you have sat down at home or in the library, and finished a poster or project from school. It's perfect. It is exactly the way you want it to be. You show it to your friends and teacher and they love it. How do you feel? Maybe you feel happy, maybe you feel like something heavy has been taken off your chest and you feel lighter and more relaxed.	PD3-2 PD3-3 PD3-7 PD3-9 PD3-10

Week Four		
Lesson 7 – Striking with legs		
Lesson Objective(s): • Learn basics of how to strike with legs ○ Front kick ○ Round house kick ○ Front knee • Develop an understanding of Loyalty	**Mathematics Outcomes:** MA3-1WM, MA3-2WM, MA3-6NA	**PDHPE Outcomes:** PD3-3, PD3-4, PD3-8, PD3-9, PD3-10, PD3-11

Orientation:	Time
• Introduce Loyalty. Briefly discuss what it is: "Being true and supportive to others" • Briefly outline the content of today's lesson: Learning how to strike with legs	5
Warm up: Choose a game from Appendix 1	5

Resources:	
Projector + Screen	1
Computer with internet access	1
Kick Shield	15
3cm x 1m x 1m Matted floor (≈36m²)	1
Whiteboard markers	30
Mini Whiteboards	30

Content	Time	Guided Discovery	Group Structure	Martial Arts Outcomes / KTP's	Maths Outcomes	PDHPE Outcomes
Front Kick	10	Demonstrate correct technique for a front kick (See appendix 11)	WG	• Bring Knee "up to chest" • Extend leg and push hips/lower back towards target • Kick with heel or ball of foot	MA3-1WM MA3-2WM MA3-6NA	PD3-4 PD3-8 PD3-10
		Using kick shields, students line up at the end of the room facing their partner. The students perform the front kick against the kick shield that their partner is holding. The aim is to push their partner who is holding the shield one step backwards with each kick, until they reach the other end of the room/space. Once they reach the other end, they switch roles. • With each kick, they count up by a number determined by the teacher. • For students who finish early can attempt to work out the total number of kicks they performed based on the end number and the original multiplier. Revise techniques and tell students to repeat the activity, with emphasis on improving their kick technique.	Pairs			

Round Kick	10	Demonstrate correct technique for a round kick In their own space somewhere around the room, the pairs of students practice the round kick 10x (each leg with) on the kick shield that their partner is holding, and then switch roles. • With each kick, they count up by a number determined by the teacher. • For students who finish early can attempt to work out the total number of kicks they performed based on the end number and the original multiplier. Revise techniques and tell students to repeat the activity, with emphasis on improving their kick technique.	WG Pairs	• Lift and Bend knee • Pivot non-kicking foot to face back of room • Turn knee over and Point it at target • Extend leg • Kick with front of shin or "shoelaces" • Reverse these steps on way back	MA3-1WM MA3-2WM MA3-6NA	PD3-4 PD3-8 PD3-10
Kick Combinations	10	Students are told to make a kicking combination of their own, using the two kicks that they had just learnt. The combination must include between 3 and 5 kicks. Once they have created their combination, they are going to practice it all the way across the room, the same as the first activity, swapping roles when they reach the other side of the room, continuing the count on the way back. Each time the combination is completed, the students earn ONE point. Once they students are back to the beginning, they are to work out the number of kicks in total that they completed, by multiplying the number of kicks in the combination by their final number. The students then create a new combination of 3-5 kicks, and repeat the activity.	Pairs	• See KTP for previous 2 strikes	MA3-1WM MA3-2WM MA3-6NA	PD3-4 PD3-8 PD3-10 PD3-11

Team kick challenge	10	In small groups, students line up and perform 6x kicks (type of kick chosen by teacher) on the kick shield at the front of the line (one student volunteers to hold the pad, switching each time the kick is changed), then run to the end of the line and perform squats while they wait. The first group to have: 1. All of the teammates complete the kicks and run to the end of the line 2. Sit down 3. Be silent -win the challenge. The winning team choose the activity the rest of the class does (e.g. Squats, lunges, push-ups etc) Each student in the group counts the kicks as they are being performed, to achieve a final score that adds up to the amount of kicks that the whole group has done (e.g. The first student performs the kicks "1...2..3..4..5..6...", the next student in line comes up and performs their kicks "7...8...9...10...11...12" and so on. Repeat this challenge several times. Vary the activity by changing the kick, or the number of kicks required.	SG	See KTP for previous 2 strikes	MA3-1WM MA3-6NA	PD3-4 PD3-8 PD3-10

Mat Chat	
Loyalty discussion	**PDHPE Outcomes**
1. What do you think loyalty means? 2. "Being true and supportive to others" 3. Has anyone heard of someone being called a 'faithful' friend? 4. A faithful, or "loyal" friend is someone who sticks by you in the good times as well as the bad times. 5. Have any of you ever had a friend who stopped being your friend for some reason? Maybe because you had an argument, or they started hanging out with kids that were more popular than you? 6. Is that a very good friend? Of course not. A good friend, a true friend is loyal no matter what. That is the kind of friend you want to have, and that is the kind of friend YOU want to be. 7. No, can you be loyal to beliefs, as well as other people? Of course you can. 8. What is something important that you believe in? Something that makes you *you*. 9. (Ask students to volunteer their answers. Answer with the sentence starter "I believe in": helping others, god, always telling the truth, never giving up, always trying your best) 10. What kind of person would I be if I only chose to believe in that when it's easy? Not a very loyal one, right? 11. Some people change, or choose to forget their beliefs just to fit in, or to make people like them who don't believe in the same thing. The problem with that is people don't respect people who change their beliefs just to fit in. 12. My advice would be to make sure what you believe in is based on being a good, and true person, and stick to those beliefs, even if it sometimes makes you unpopular or dislikes. Because being loyal is not only being loyal to other people, but to your beliefs. 13. Meditation (1 .5 minutes sitting on knees or with crossed legs [with good posture and eyes closed]) As you begin to close your eyes, breathe in deeply through your nose and out through your mouth. After you fill up your lungs with air, imagine you are breathing out through a straw. Slowly letting the air back out. While you are breathing, you are calming yourself and relaxing. Think about what loyalty means to you. Who are the people you show loyalty to? Who shows loyalty to you? Maybe it is a friend, someone at home, maybe it is a teacher. How does it make you feel when people show loyalty? Does it make you feel safe? Does it make you feel loved? How can you be a good, loyal friend to the people around you?	PD3-3 PD3-9 PD3-10

Week Four		
Lesson 8 - Teamwork		
Lesson Objective(s): • Teamwork • Improve students ability to work with others • Support collaboration, communication and sharing of ideas	**Mathematics Outcomes:** MA3-1WM, MA3-3WM, MA3-5NA, MA3-6NA	**PDHPE Outcomes:** PD3-4, PD3-5, PD3-6, PD3-7, PD3-8, PD3-9, PD3-10

	Time	Resources:	
Orientation: • **Discuss WALT:** **The importance of teamwork: the combined action of a group, especially when effective and efficient**	5	Projector + Screen	1
		Computer with internet access	1
		Bean-bags	20
		Square origami paper	50
		Scissors	30
Warm up: Bean-bag "wars" (Appendix 1) – MA3-1WM, MA3-3WM, MA3-5NA After first game is played. Give the teams 1 minute to discuss tactics to try and perform better in the next game. Repeat this process for the third game.	5	3cm x 1m x 1m Matted floor (≈36m²)	1
		Battle Rope	2
		Number Targets	

Content	Time	Guided Discovery	Group Structure	Martial Arts Outcomes / KTP's	Maths Outcomes	PDHPE Outcomes
Partner counter balances	2	The teacher demonstrates a counter balance, or guides 2 students through the process in front of the class.	Whole group			PD3-4 PD3-5 PD3-8 PD3-9 PD3-10
		• The students are given one minute to figure out how to perform this balance. • The teacher then says, "okay, now hold it". All students hold the position while the teacher checks each pair	Pairs			
Team balances/ lifts	8	The teacher demonstrates a balance/lift, or guides a group of students through the process in front of the class.	Whole group	Appendix 12		PD3-4 PD3-5 PD3-8 PD3-9 PD3-10
		• The students are given one minute to figure out how to perform this balance. • The teacher then says, "okay, now hold it". All students hold the position while the teacher checks each pair	SG			

Origami ninja stars	30	• In small groups (3-4), students create their own origami ninja star. • Students are given ONE set of instructions (appendix 13) per group. Tell the class that because of this, they must use communication and cooperation to complete the task. They must listen to each-other, share their ideas, and work as a team. • Once the ninja stars are created, the teams use their ninja stars and a 12 sided die, with numbered ground targets for (+/-/÷/x) games, rotating from station to station each 1.5 minutes. • Addition: Roll the die, throw the star onto the target. Add the number on the die to the number hit on the target • Subtraction: Roll the die, throw the star onto the target. Subtract the smallest number from the largest number • Multiplication: Roll die, throw star, multiply number rolled by the number hit on the target • Division: Roll die, throw star, divide largest number by the smallest number	SG	Allow students 10 minutes to complete Origami by themselves, then walk around to assist, as this will take time.	MA3-1WM MA3-5NA MA3-6NA	PD3-9 PD3-10
Tug of War	5-10	In small groups, students play tug of war with the other groups until all teams have versed each other.	SG			PD3-4 PD3-5 PD3-8 PD3-10

Mat Chat	
• **Revise definition of Teamwork:** The combined action of a group (especially when effective and efficient) • **Why is teamwork important?** When people work together, each of their talents brings the group closer to their goal. E.g. In the human pyramid, the bigger and stronger people went on the bottom, and the smaller people went on top. This resulted in the pyramid working properly. The two bigger people couldn't just hold each other up, and neither could the smaller people. You can't make a pyramid on your own. So the pyramid only works when you use everyone's strengths and abilities. The bigger people have the ability to hold others up, and the smaller people have the ability to stand up the top without hurting the people on the bottom. • **What can you do to make sure you are being a good team member?** ○ <u>Communicate</u>: Let the group know you have an idea. ○ <u>Listen</u>: Let other group members share their ideas. ○ <u>Be humble</u>: If the group does not go with your idea, do not get mad or upset. • **Meditation (2 minutes)** As you begin to close your eyes, breathe in deeply through your nose and out through your mouth. Fill up your lungs with air. Hold it for a moment, and slowly release it out through your mouth. While you are breathing, you are calming yourself and relaxing. Think about your perfect team. Who is on it? It could be anyone you want. Friends, family members, a character from a TV show or movie. Anyone at all. This is *your* perfect team. What is the team trying to do? What is your role? What will the other members of the team do? Will they each do the same thing, or will they use each of their individual strengths?	**PDHPE Outcomes** PD3-6 PD3-7 PD3-9 PD3-10

Week Five

Lesson 9 – Wrestling / Grappling

Lesson Objective(s):	Mathematics Outcomes:	PDHPE Outcomes:
• Wrestling/Grappling • Honesty	MA3-1WM, MA3-6NA	PD3-3, PD3-4, PD3-5, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11

	Time	Resources:	
Orientation: • **Discuss WALT:** • **The importance of honesty: Being truthful; always seek to do what is right** • **Basics of wrestling and grappling**	5	Projector + Screen	1
		Computer with internet access	1
		"I have…Who has…" resource	1
Warm up: See "Clinch drill" in warm up activities.	5	3cm x 1m x 1m Matted floor (≈36m²)	1

Content	Time	Guided Discovery	Group Structure	Martial Arts Outcomes / KTP's	Maths Outcomes	PDHPE Outcomes
Headlock throw (from knees)	5	Teacher demonstrates the technique, and guides a pair of students through the technique, asking observers to help step the pair through the technique	WG	• Both students start in a tall kneeling position (not sitting on heels) • Step across into headlock and grab back of elbow with other hand • Break opponents balance, turn head, then shoulders and fall into position	MA3-1WM MA3-6NA	PD3-4 PD3-8 PD3-9 PD3-10
	10	Using the "I have…who has…?" cards, students find their partner, show the teacher as they return their card into the container, then go and practice the technique for 2 minutes. After 2 minutes, students stop, collect a new card and repeat the process with a new partner.	Pairs			
Escape mount – "Bridge and roll"	5	Teacher demonstrates the technique (appendix 14), and guides a pair of students through the technique, asking observers to help step the pair through the technique	WG	• Beginners may sit on partner with their feet in-front, and their knees pointing to the sky – this is incorrect. • Ensure students are "kneeling" with their knees beside partners ribs, and their feet are touching their hips • Student on bottom should ALWAYS have knees bent, not lay flat. • Buck hips • Grab arm, hook ankle with ankle (same side as trapped arm. • Bridge hips and roll to the same side as trapped limbs	MA3-1WM MA3-6NA	PD3-4 PD3-5 PD3-8 PD3-9 PD3-10
	10	Using the "I have…who has…?" cards, students find their partner, show the teacher as they return their card into the container, then go and practice the technique for 2 minutes. After 2 minutes, students stop, collect a new card and repeat the process with a new partner.	Pairs			
Put it together	10	In Pairs or trios, students take it in turns to: 1. Apply one of the two takedowns learnt today 2. Once they have applied the takedown, they must get into the "mount" position 3. Once they are in the "mount" position, the student on the bottom will apply the "bridge and roll" technique to escape. 4. Once they have performed the bridge and roll technique, both students stand back up and reverse roles.	Pairs / SG			PD3-4 PD3-5 PD3-8 PD3-9 PD3-10 PD3-11

Mat Chat	
1. Ask students to recall the definition of honesty, or to make up their own. 2. What does being truthful mean? (always telling the truth) 3. Have any of you ever had someone lie to you? How did that make you feel? (bad, upset, hurt, angry, ***betrayed*** etc.) 4. "Exactly – because you felt tricked. You trusted that person to tell you the truth and they didn't. When they lied to you, it hurt your feelings" 5. So why is it wrong to lie? Because it is hurtful to trick people who trust you. When someone trusts you, you need to respect them and their feelings. 6. You want to be someone other people can trust. People really look up to, and admire trustworthy people. 7. Meditation (1.5 minutes sitting on knees or with crossed legs [with good posture and eyes closed]) As you begin to close your eyes, breathe in deeply through your nose and out through your mouth. While you are breathing deeply, you could think about times where you have been honest with someone. Maybe someone has shown you honesty. Think about how that made you feel. Did it make you feel happy? Maybe it made you feel relieved that you finally found out the truth. Breathe deeply through your nose and out through your mouth. Thinking about a world where everyone is honest. What would that be like?	**PDHPE Outcomes** PD3-3 PD3-7 PD3-9 PD3-10

Week Five			
Lesson 10 – Wrestling / Grappling			
Lesson Objective(s): • Wrestling/Grappling • Honesty		**Mathematics Outcomes:** MA3-1WM, MA3-6NA	**PDHPE Outcomes:** PD3-3, PD3-4, PD3-5, PD3-7, PD3-8, PD3-9, PD3-10, PD3-11
Orientation: • **Discuss WALT:** • **The importance of honesty: Being truthful; always seek to do what is right**	**Time**	**Resources:**	
		Projector + Screen	1
		Computer with internet access	1
		3cm x 1m x 1m Matted floor (≈36m²)	1
Warm up: The Herding Game		"I have…who has…" game	1

Content	Time	Guided Discovery	Group Structure	Martial Arts Outcomes / KTP's	Maths Outcomes	PDHPE Outcomes
Escape/Pass guard (top) "Split pass"		Teacher demonstrates the technique, and guides a pair of students through the technique, asking observers to help step the pair through the technique	WG	• Appendix 15	MA3-1WM MA3-6NA	PD3-4 PD3-8 PD3-9 PD3-10
		Project single digit (+ - ÷ x) questions up on board (or have students write them on mini whiteboards prior). Students complete the technique once, get up and sprint to other side of the space to their whiteboard and complete Q1, sprint back and complete technique again. Repeat process until all 10 questions are answered, then switch roles with partner (ensure answers are erased first)	pairs			
Escape Guard (bottom) "scissor sweep"		Teacher demonstrates the technique, and guides a pair of students through the technique, asking observers to help step the pair through the technique	WG	• Appendix 16	MA3-1WM MA3-6NA	PD3-4 PD3-8 PD3-9 PD3-10
		Project single digit (+ - ÷ x) questions up on board (or have students write them on mini whiteboards prior). Students complete the technique once, get up and sprint to other side of the space to their whiteboard and complete Q1, sprint back and complete technique again. Repeat process	pairs			

		until all 10 questions are answered, then switch roles with partner (ensure answers are erased first)				
Put it together		1) With Student A in mount, Student B performs the escape from mount 2) Student B performs the "guard pass" and gains mount. 3) Student A performs the escape from mount. 4) Student B performs the "scissor sweep" 5) Students then switch who is A and B and repeat the process from the beginning. Display these instructions on the board for students to refer to during practice.	pairs			PD3-4 PD3-8 PD3-9 PD3-10

3 second pin wrestling		Outline rules:
		• Students choose a number between 1 and 12 as their multiple
		• The objective of the game is to "pin" their partner, vice versa.
		• For a student (student A) to achieve a "pin", student A must hold their partner (student B) down, with both of Student B's shoulders touching the ground for 3 seconds. Rather than counting their seconds, they must count up by their chosen number. Each time they pin their partner, they continue counting by their multiple
		  ○ E.g. Multiple = 5.
		  ○ 1st Pin = 5, 10, 15...
		  ○ 2nd Pin = 20, 25, 30...etc
		• If student B manages to get one, or both shoulders off the ground during the 3 second count, the count must begin again.
		• At the end, the students work out how many pins they achieved by dividing their final number by 3.
			pairs	• Aim to be on top
				• Try hard not to be on the bottom
					MA3-1WM
					MA3-6NA
						PD3-4
						PD3-5
						PD3-8
						PD3-9
						PD3-10
						PD3-11

		3 x 2-minute rounds. Change partners each round.				

Mat Chat	
Honesty discussion	**PDHPE Outcomes**
1. Ask students to recall the definition of honesty, or to make up their own. 2. Last we spoke about honesty in general, and why it's important to be honest to people who trust us. Now we're going to talk about being honest in our actions 3. Some of you might do jobs around the house, or do chores to earn pocket money. Let's pretend you worked really hard to save up your allowance, pocket money, whatever you want to call it. You saved, and worked really hard and finally you could buy a new bike. After months and months, maybe even years, you finally have enough. You get someone at home to take you to the store. You pick out the exact one that you want. The size and colour are perfect. You are so happy, and so proud of yourself. You take it straight home and ride it all day. That night you are so exhausted that you forget to take it around the back. You have left it in the front yard. The next morning you come out to find that someone has stolen your bike. 4. How would that make you feel? 5. Stealing is probably the most common *dishonest* thing that people do. (Check for understanding of *dishonest*) 6. Honesty is also important because it is a way that we respect the rights and property of others. 7. If we lived in a world where people just took things from other people whenever and however they wanted, we wouldn't be living in a very nice place. We would all be fighting and stealing all the time. That's why it's important to be honest. So we can live in a world of trust, respect, and safety. 8. Meditation (2 minute sitting on knees or with crossed legs (with good posture and eyes closed)) As you begin to close your eyes, breathe in deeply through your nose and out through your mouth. While you are breathing deeply, you could think about times where you have been honest with someone. Maybe someone has shown you honesty. Think about how that made you feel. Did it make you feel happy? Maybe it made you feel relieved that you finally found out the truth. Breathe deeply through your nose and out through your mouth. Thinking about a world where everyone is honest. What would that be like?	PD3-3 PD3-7 PD3-9 PD3-10

Week Six		
Lesson 11 – Mixed Martial Arts		
Lesson Objective(s): • MMA • Perseverance + Resilience	**Mathematics Outcomes:** MA3-1WM, MA3-2WM, MA3-3WM, MA3-5NA	**PDHPE Outcomes:** PD3-2, PD3-4, PD3-5, PD3-8, PD3-9, PD3-10, PD3-11

	Time
Orientation: • **Define perseverance:** To Persist; have a "never give up" attitude	5
Warm up: Choose warm-up game from Appendix 1	5

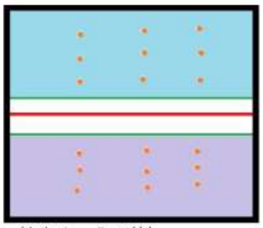
Resources:	
Projector + Screen	1
Computer with internet access	1
Kick-Shields	15
Focus Mitts (pairs)	15
3cm x 1m x 1m Matted floor (=36m²)	1
Boxing gloves (pairs)	15
Mini-Whiteboards	30
Whiteboard Markers	30

Content	Time	Guided Discovery	Group Structure	Martial Arts Outcomes / KTP's	Maths Outcomes	PDHPE Outcomes
Striking combinations	5	Demonstrate the following combination for the class: 1. (L) Jab, (R) cross, (L) cross, (R) round kick Give students one minute to practice this combination on a kick shield. After one minute, the students switch roles (striker and pad-holder). Repeat the above process for the following combination: 2. Jab, Cross, (L) Knee, (R) front kick	Pairs	• See KTP for these strikes in previous lessons	MA3-1WM MA3-2WM MA3-3WM MA3-5NA	PD3-4 PD3-8 PD3-10 PD3-11
	10	1. Students create their own combination with the strikes they just practiced. ○ Assign each strike a number between 1 and 4 (Jab=1, Cross=2, Knee=3, Kick=4). Teacher gives students a number between 5 and 20. Students use the numbered techniques to make a combination that adds up to the given number. ○ Give sufficient time for each pair/group to create a combination ○ Divide class in half. Half the class will kneel down and watch the pairs/groups from the other half perform their combination (all at the same time). The roles are then reversed.	Pairs / SG			
Takedown	10	Revise the following technique for the class: 1. "Headlock throw" Takedown Give students three minutes to practice this technique, taking it in turns to apply the technique twice, then their partner does the same, repeating this process until the time is up.	Pairs / SG	• See KTP for these strikes in previous lessons		PD3-4 PD3-8 PD3-10 PD3-11
Striking combinations and takedowns	5	Make up own striking combination, and make it lead into a takedown. Students may choose to: ○ In pairs: Use kick shield or focus mitts OR ○ In small groups: 1. Student One holds focus mitts, 2. Student Two holds a kick shield (optional and interchangeable with focus mitts) 3. Student Three has takedown applied on them 4. Student Four performs the strikes on the mitts and/or kick-shield, then applies the takedown. No matter what group size chosen, students take turns of both/all roles.	Pairs / SG	• See KTP for these strikes in previous lessons		PD3-4 PD3-5 PD3-8 PD3-10 PD3-11
	5	Repeat the process above, but this time the students add one of the following "ground technique" into their combination: • "Bridge and Roll"				

	15	Students are encouraged to use a number line drawn on their group's mini-whiteboard, and utilise the jump strategy. The teacher presents the students with a number problem (e.g. 3000-673) Students should try to complete the number line in the most efficient way Students assign martial arts techniques to represent numbers. E.g. • Jab = 1 • Cross = 10 • Kick = 100 • Takedown = 1000 In this case, the answer would be 2327, and the students would perform 7 Jabs, 2 Crosses, 3 Kicks, 2 takedowns. Students may work in groups and create a role play demonstration of this. Situation could include multiple "attackers" in order to increase difficulty. E.g. One student defends against 3 attackers.	Pairs / SG	• See KTP for these strikes in previous lessons	MA3-1WM MA3-2WM MA3-3WM MA3-5NA	PD3-4 PD3-5 PD3-8 PD3-10 PD3-11

Mat Chat	
	PDHPE Outcomes
1. Ask students to recall the definition of perseverance, or to make up their own. 2. Have you ever tried to learn, or do something hard, or frustrating? (Give students an example of when <u>you</u> have had this, so they see that it happens to everyone, e.g. learning a song on guitar. Finish with *"because I never gave up, I was able to achieve my goal"* 3. Let's look into this a little deeper, to figure out how we can learn to persevere in the face of hardship. 4. Who's heard of Albert Einstein? (one of the greatest scientists EVER!) Almost all of you, right? But did you know that he couldn't talk until he was 4 years old? Couldn't read until he was seven? He even got expelled for being a day-dreamer, and his teachers thought he would never amount to anything? 5. Even through all of that, he still believed in his ability to learn and become great. There is a lesson in that, isn't there? One of Einstein's famous quotes is this: *"If I believe it, I can achieve it"*. I want you all to repeat that to yourselves, ready? 6. I want you to say that yourself anytime you are facing a tough challenge and you want to quit. Keep telling yourself *"If I believe it, I can achieve it"* 7. Meditation (2 minutes sitting on knees or with crossed legs [with good posture and eyes closed]) Now as you close your eyes and breathe in deeply through your nose and out through your mouth, think to yourself...If I can believe it, I can achieve it"	PD3-2 PD3-9

Week Six						
Lesson 12 – Martial Acrobatics						
Lesson Objective(s): • Martial Acrobatics • Perseverance			**Mathematics Outcomes:** MA3-1WM, MA3-5NA		**PDHPE Outcomes:** PD3-2, PD3-4, PD3-8, PD3-9, PD3-10, PD3-11	
		Time	**Resources:**			
Orientation: • **Revise Perseverance:** To Persist; have a "never give up" attitude		5	Projector + Screen Computer with internet access Kicking Targets Flexi-domes			1 1 15 13
Warm up: The Herding Game		10	3cm x 1m x 1m Matted floor (≈36m²)			1
Content	**Time**	**Guided Discovery**	**Group Structure**	**Martial Arts Outcomes / KTP's**	**Maths Outcomes**	**PDHPE Outcomes**
Jump-front kick	10-15	1. Instructor demonstrates technique 2. "Copy Me" – Instructor vocalises each step 3. "Copy Me" – Instructor students vocalise steps 4. "Copy Me" – Instructor simply says "go" and all perform technique	WG	Appendix 17	MA3-1WM MA3-5NA	PD3-4 PD3-8 PD3-10
		In pairs, students take turns (one round each) holding the kicking target for their partner to practice the technique on. Each student remembers their score. After both students have completed their round, they add both of their scores together. Repeat this process and attempt to beat their previous score.	Pairs			
Tornado Kick	10-15	1. Instructor demonstrates technique 2. "Copy Me" – Instructor vocalises each step 3. "Copy Me" – Instructor students vocalise steps 4. "Copy Me" – Instructor simply says "go" and all perform technique	WG	Appendix 18	MA3-1WM MA3-5NA	PD3-4 PD3-8 PD3-10
		In pairs, students take turns (one round each) holding the kicking target for their partner to practice the technique on. Each student remembers their score. After both students have completed their round, they subtract the larger score from the smaller score. The aim is to get as close to zero as possible.	Pairs			

Team battles	10-15	Class is divided in half (blue/purple team). Each half is then grouped into smaller (even) lines of 3-5 students that face their "opponent group" on the other half of the room. The aim is to perform the technique with more intensity and accuracy than the person on the other team. Start with some battle cry wars to get the students excited and engaged, attempting to out-yell the other team. In their lines the students: -Jog on the spot until they reach the marker at the front of the line. -They then approach the green line/cone. These cones should be adequately far away from the centre so that students cannot contact their counterpart. They perform the technique on the spot at the same time as their counterpart (not making contact) -Under no circumstances are the students to cross the centre of the space (red line), as this may result in a clash.  1. Begin with the Jump-Front kick 2. Ask the group if they have a technique (from the program that they would like to do next (choose a popular suggestion)	SG			PD3-4 PD3-8 PD3-10 PD3-11

		3. Each student performs their own personal combination of 3 kicks/punches. (give them a minute to silently visualise their combo) 4. Finish with the tornado kick. NOTE: Once students complete technique, ALL should run to *their* right, to the end of their group. This avoids clashes with other teammates.				

Mat Chat	
1. If time allows, students may choose a game (warm up activity) from the program that they wish to play before the program concludes.	**PDHPE Outcomes**
2. Ask students to recall the definition of Perseverance, or to make up their own. 3. Let's talk about quitting too soon. There is a really good quote: "*Quitters never win, and winners never quit*" Who can have a go at explaining that for me? 4. Here is something really interesting that you should think about. When you talk to successful people, they will often tell you that the only difference between them and others is who failed is that they never gave up. 5. Think about the light bulb. Who knows the name of the man that invented the light bulb? (Thomas Edison). A lot of you might have heard of him before, and how important an invention the light bulb was, and still is. But did you know that he failed 1,000 times before he successfully created a light bulb that would last? 6. He famously said "*I didn't fail 1,000 times. The light bulb was an invention with 1,000 steps.*" 7. Almost everything worth having, or achieving is going to take some time and effort. Sometimes, it takes a lot of time, and can be really hard and you will feel like quitting. But if you quit, you will never achieve it. 8. There is a man on YouTube that talks about the 40% Rule. He says a really tough guy from the Navy Seals taught him. Maybe you ask your teacher to have a look for it one day, but basically, he believes that whenever you feel like you can't go any further, and you want to give up, you are only 40% done. Your mind and body still have another 60% left in them. Your tank of fuel isn't empty, in-fact it's not even half-empty, it just feels like it. You might feel exhausted, bored, sad, frustrated, angry, or even hurt, but you still have more in you. You just need to realise that and dig a little deeper, and you will achieve your goal. If you are already at that point, it means you have already put time and effort it. You are already feeling like that, get something out of it, rather than quitting and making yourself feel that way for nothing. Remember, Quitters never win, and winners never quit. If you give up, you will never achieve the goal. But if you push through a little further, even if you don't quite make it, you will still have gotten closer to that goal. 9. Guided Meditation (2 mins) As you close your eyes now for the last time in this program, I am going to read you one last quote. I want you to reflect on how far you have come in the last six weeks. What you can do now that you couldn't before. Maybe it's a kick, maybe it's a safety roll. Maybe you can work better in a group than you could before. Maybe you are more confident with adding or multiplying. Even if it is something outside of Kick-Smart. You are constantly improving. Now as you breathe through your nose and out through your mouth, I want you to think about what I say next. "Shoot for the moon. Even if you miss, you'll land among the stars" 10. Thank all students for coming, and wish them all the best for whatever goals they set from now on.	PD3-2 PD3-9

Appendix 1

Numeracy-Based Warm-Up Games

Number Up

- Students move around in the grid performing various locomotor activities (e.g. run, skip, hop, side gallop)
- The teacher will call a number and students will move quickly into groups of the specified number

Maths Integration: The teacher will call mathematics equations / operations (depending on age) and the students will form groups according to the answer.

Example Questions

- How many sides has a triangle?
- What is the remainder when we divide 20 by 3?
- How many vertices on a triangular prism?

Ladder Activities

- Students perform various agility runs through the ladder (e.g. one step, double step, side-step, in & out) and then sprint forward to the end marker.
- Ball passing can be added to extend the skill, as can additional maths equations

Maths Integration: tasks added (eg. Mulitplication tables). Allow students to choose their own maths tables

Greedy Birds

- Split the class into 4 even groups (6-8 groups for large classes)
- Each group lines up on a corner of a square grid approx. 20m x 20m (or 1/3 netball court)
- 20-30 beanbags are placed in the middle of the grid inside a hoola hoop
- On 'go' one player from each team runs to the middle to collect a bean bag
- Once the bean bag is placed on the ground at the team corner then the next runner goes

  Rules: one runner from each time only, no guard the bean bags, collect only one bean bag at a time, once all bean bags have been taken from the middle then teams may steal from other team's collections, play for 3 minutes, team with the most bean bags wins.

Maths Integration: give each colour a point value (e.g. red = 1point blue =2 points). The team with the greatest points wins. Play with numbered bean bags for older children.

Skipping activities

- Students can ask each other the algorithms e.g. How many more to 10, if I have got 5.
- Students in Stage 2 and 3 can complete problem solving questions, for example: 76% of students like weekends, what percentage do not like weekends.

  Fractions- what is 3/7 of 21 etc. Partner A skips the number of Skips from the answer. Partner B skips the other fraction. Eg, 3/5 of 20. Then discuss their answers.

What's the question Sensei?" (Kick – Jump – Lunge)

- One person (e.g. instructor) is the "Sensei", and stands at one end of a square area approx. 20m x 20m. The rest of the students line up along the opposite end (the baseline), facing the caller.
- The students individually choose one of the following movements: Kick, double footed jump, or a lunge. This is the movement they perform as they approach the caller (students may choose to alternate between the three movements as they approach the Sensei).
- When the Sensei is facing away from the group, the group shouts "*What's the question Sensei?"* The Sensei calls out simple (+ - x ÷) questions (e.g. 25 ÷ 5, or 2 x 4). The group performs the appropriate number of their chosen movements towards the caller and stops and repeats the group call "*What's the question Sensei?"*
- At any time when the group is moving forward, the Sensei may shout out "*Kicking!*", "*Jumping!*" or "*Lunging!*" Any student who is performing that movement at the time must run back to the baseline and start again.
- Once someone is within touching distance of the Sensei, they touch him/her on the shoulder.
- The Sensei then attempts to tag students before they reach the baseline.
- The first person to be tagged is the caller for the next game. Anyone else who is tagged after that must go to the side, perform 5 squats and re-join the game.

Find the Answer

- Scatter 20 flexidomes (Numbered 1-20) randomly throughout the area
- Students are asked various questions (that have an answer between 1 and 20) e.g. What is one factor of 40?
- Students then perform a set movement (e.g. Skip, hop, jump, lunge, bear walk, army crawl etc.) to their answer.
- When the next question is asked, the students move to the appropriate flexidomes from the one they are currently at.

<u>Question examples:</u>

- What is one factor of 40? Repeat this question, but change the number (75, 16, 84 etc)
- Show me a factor of 24, then hop to the pair of the factor (e.g. Students at number 12 hop to number 2). Repeat, but change number and action
- Find multiples of the number 3. Repeat but change number (e.g. 2, 4, 5)
- Find a prime number. Repeat with odd/even number
- Find an odd number that is not a prime number

True or False?

- Students stand with feet together on a line, all facing towards the teacher.
- Teacher calls out different questions which the students have to answer by jumping to one side of the line. One side representing true, the other side representing false.

- The teacher slowly counts down from 10 to 0 to allow students to process question. During this time, the students perform a repetitive exercise such as: front kicks, cross punches, jogging on spot etc.

- Once the countdown reaches zero, the students jump to the appropriate side of the line.
- Select students to justify their answer.
- Reset on the line and repeat with different questions

Question examples:

- True or false, the number 64 is a square number? Repeat with other numbers (e.g. 9, 18, 100)
- True or false, 51 is a prime number? Repeat with other numbers (e.g. 3, 15, 97)
- True or false, $17 \times 3 = 41$? Repeat with other multiplication questions
- True or false, $70 \div 7 = 10$? Repeat with other division questions
- True or false, $9 + 47 = 58$? Repeat with other addition questions
- True or false, $103 - 55 = 48$? Repeat with other subtraction questions

Bean-bag Wars

- Scatter 20 bean-bags randomly around the square game-space (approx. $30m^2$), which is divided in half (with markers) similar to a tennis court layout
- Assign each colour a number of points E.g. Red= 3, Blue=1, Green=2
- The objective of the game is to have as many bean-bags on the opposing team's side (using underarm throws only) when the timer runs out. (Any outside the game-area do not count)

- At the end, the teams switch sides to collect their bean-bags to count up their scores. The team with the highest score wins.
- To increase difficulty, increase the number value of the bags, or introduce a number that both teams must multiply their scores by after they have added up the bean-bags.
  - NOTE: Each team may require a mini-whiteboard or working out paper to work out the scores

Clinch Drill

- In Pairs, students practice their "Over/Under" clinch
- They continuously alternate between having: left hand over-hook and right hand under-hook; and: right hand over-hook and left hand under-hook
- The students choose a number between 2 and 12. Each time they switch their position, they count up by that number. E.g. "3, 6, 9, 12..."
- Once they reach the 10^{th} number, they perform 2 back break-falls and restart the drill. They may choose to keep the same number each time, or use a new number each time.

Odds and Evens

Similar to scissors, paper rock.

- Students call one two three SHOOT and hold out as many fingers as they wish (between 1 and 10).
- The teacher then yells out either "Odd!" or "even!"

- Whoever has the selected category of fingers out must escape to "safety" (the other side of the room) before being tagged.
- If both students have the same category, they perform 5 push ups, or 5 squats while the other pairs chase each other.

The Herding Game

- Count students and tell them the total number prior to playing (e.g. 22)
- Students randomly move around the given space (teacher may choose to give a specific way to move e.g. skip, hop, lunge)
- Teacher yells out "Sheep, form groups of [e.g. 7]!"
- After the students have formed groups of seven, the teacher says "Leftover animals, go to the holding pen!"
- Identify the number sentence:

Total no. of students ÷ no. given by teacher **=** no. of groups, **with a remainder of** no. of students in "holding pen"

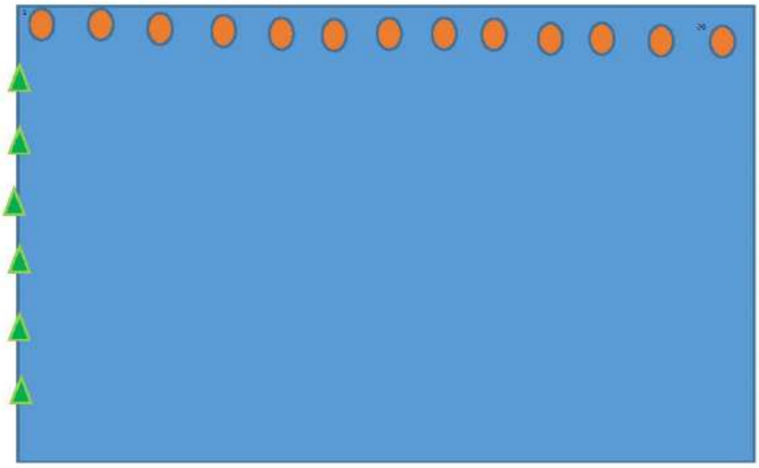
E.g.

22 ÷ **7** = **3**, with a remainder of **1**

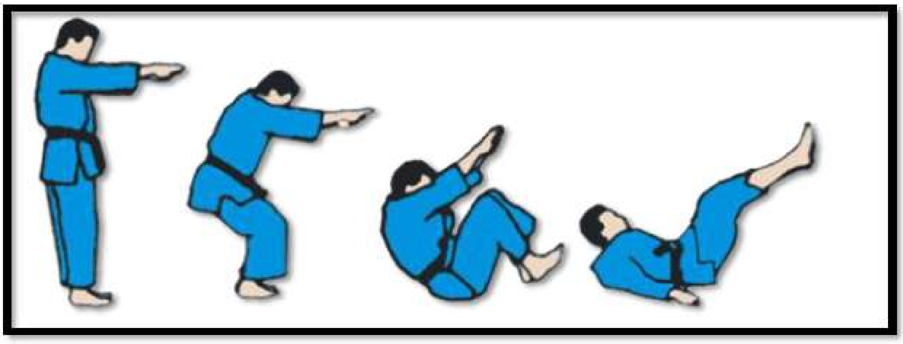
Number Line

- Students (triangles) line up on baseline, perpendicular to the number line (numbers 1-20 spaced roughly 1m apart) (dots)
- Teacher calls a question, e.g. how many sides does a square have, 4x4, etc

- Students jog (or any other movement given by teacher) to the appropriate distance
- Students either jog / move back to baseline (upon teacher request), or wait for next question, e.g. (add 4, divide by 2, etc)

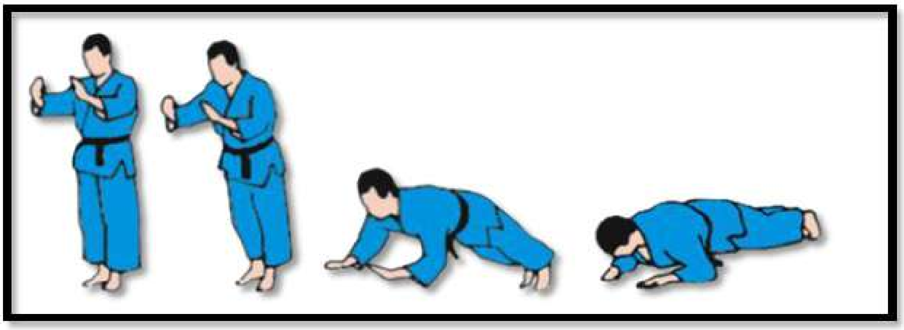


Appendix 2 **Break Falls**



Back Break-falls

1. Cross their arms across their chest
2. Put their chin on their chest
3. Squats down on the mat
4. Rocks backwards
5. Staying on their back hits the mat with both hand



Front Break-fall

1. The novice starts from a kneeling position. They are then asked to lay down completely with their elbows and hands completely flat on the mat and their heads turned to the side (to protect their nose). This they are told is the position they are wanting to end up in.

2. Kneeling again the student is told to try and fall into the position they were laying in.

3. As they fall, students bend their arms to absorb the fall, fingers facing forward. The force of the landing is absorbed through the fingers, palms, wrists and finally, the elbows. To avoid being winded from the fall, students avoid landing on their stomach, and urn their heads to avoid hitting their nose.

Ninja – Ninja – SAMURAI!

This is basically "Duck – Duck – Goose!"

1. Sit in a circle in a kneeling position, facing the middle.

2. The person who is ***IN*** walks around the circle touching each person lightly on the shoulder

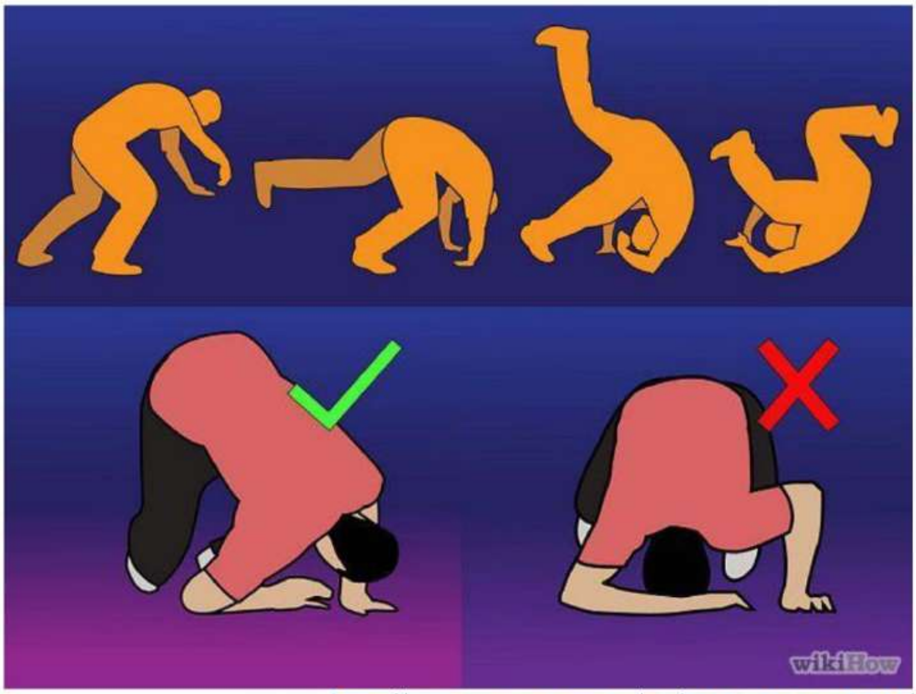
3. If the person who is in touches someone on the shoulder and says "ninja", they must perform a front break-fall on the spot and return to a kneeling position.

4. If the person who is in touches someone on the shoulder and says "Samurai", they must jump up from their kneeling position and try to tag the person who is in, before they get back to their position.

5. If "Samurai" does not catch the person who is in, they are now in. If the "Samurai" does catch the person, the samurai returns to their position and the person who was in continues to be in.

NOTE: Make sure each player is a safe distance from the person next to them, to avoid colliding during break-falling.

Appendix 3 **Forward safety roll**



Source: https://www.pinterest.com.au/pin/551902129321973991/

Steps:

1. Start in a squatted position on the ground.
2. Reach both arms diagonally, to one side of body.
3. Place your hands together on the floor, palms flat.
4. Drop the forward shoulder to the ground and tuck chin into the opposite armpit.
5. Push off with feet to propel the roll forward.
6. Roll across back along a line from forward shoulder to the opposite hip.
7. During the roll, tuck one foot (the same side as the back shoulder) under the bottom to strike the ground.
8. The other leg should be partially extended, and ready to take weight as weight is shifted onto the first foot.
9. Shift weight fully onto feet and stand.

Appendix 4 **Safety Vault**

Step 1. Put non dominant hand on top of obstacle (straight arm)

Step 2. Place dominant foot on top of obstacle

Step 3. Raise non-dominant foot off the ground by putting weight onto planted hand and dominant foot.

Step 4. Thread foot through the gap between planted hand and dominant foot.

Step 5. Reach non dominant foot forward towards the landing zone

Step 6. Transfer weight onto non-dominant foot and release hand from obstacle and continue to run straight.

NOTE: Keep both hips facing forward, even on descent from obstacle. This maintains forward momentum and efficiency of movement.

<u>Appendix 5</u> **<u>Speed Vault</u>**

1. Run toward the obstacle
2. Launch off of the leg on the same side as the hand placed on the obstacle,
3. Brush hand on object just enough to launch yourself forward over the obstacle,
4. Come out in one-footed run, landing on the leg you used to launch over.
5. Note: It may be useful or stylistically important to split the legs when speed vaulting instead of keeping them side by side. Also, a risk with using the speed vault is smashing a knee on the object so keep that in mind during take-off.

<u>NOTE:</u> Avoid the urge to place the hand on the obstacle before taking off; this isn't a progression as the body mechanics and use of momentum are completely different.

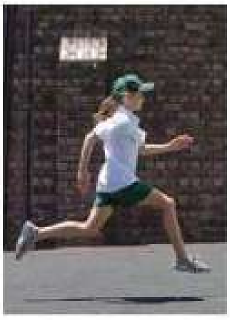
NOTE: Keep both hips facing forward, even on descent from obstacle. This maintains forward momentum and efficiency of movement.

<u>Appendix 6</u> **<u>Sprint</u>**

Skill components (Introductory components marked in bold):

1. Lands on ball of the foot.
2. Non-support knee bends at least 90 degrees during recovery phase.
3. **High knee lift (thigh almost parallel to the ground).**
4. **Head and trunk stable, eyes focused forward.**
5. Elbows bent at 90 degrees.
6. **Arms drive forward and back in opposition to the legs.**

1 2



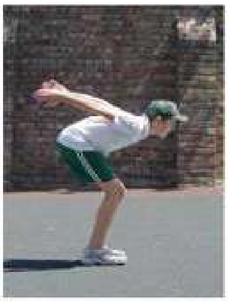
3 4

5 6

Appendix 7 **Ducking**

1. Keep hands up
2. Have a solid fighting stance
3. Bend a the knee and hip
4. Keep eyes on opponent (don't look down)

Appendix 8 **Vertical Jump**



1 2 3 4 5 6

Skill components (Introductory components marked in bold):

1. **Eyes focused** forward or upward throughout the jump.
2. Crouches with knees bent and arms behind the body.
3. **Forceful forward and upward swing of the arms.**
4. Legs straighten in the air.
5. **Lands on balls of feet and bends knees to absorb landing.**
6. Controlled landing with no more than one step in any direction.

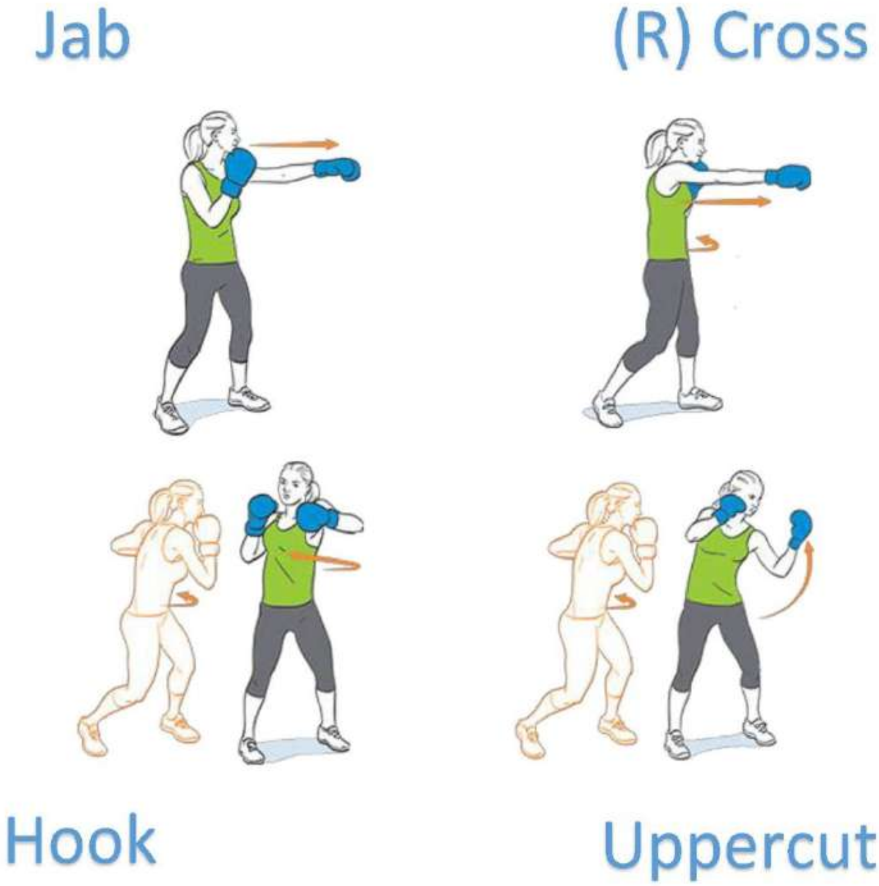
Appendix 9 **Shell block**

1. Shoulders tucked up to ears
2. Palms on forehead
3. Elbows together
4. Peek through the gap

NOTE: If the attack comes to the side (e.g. hook punch), slide the appropriate hand back and raise elbow to cover side of head and face. ("Imagine rubbing shampoo into your hair")

Appendix 10

Four basic Punches:



Appendix 11 **How to do a front Kick / "Teep" kick**

Step into a fighting stance

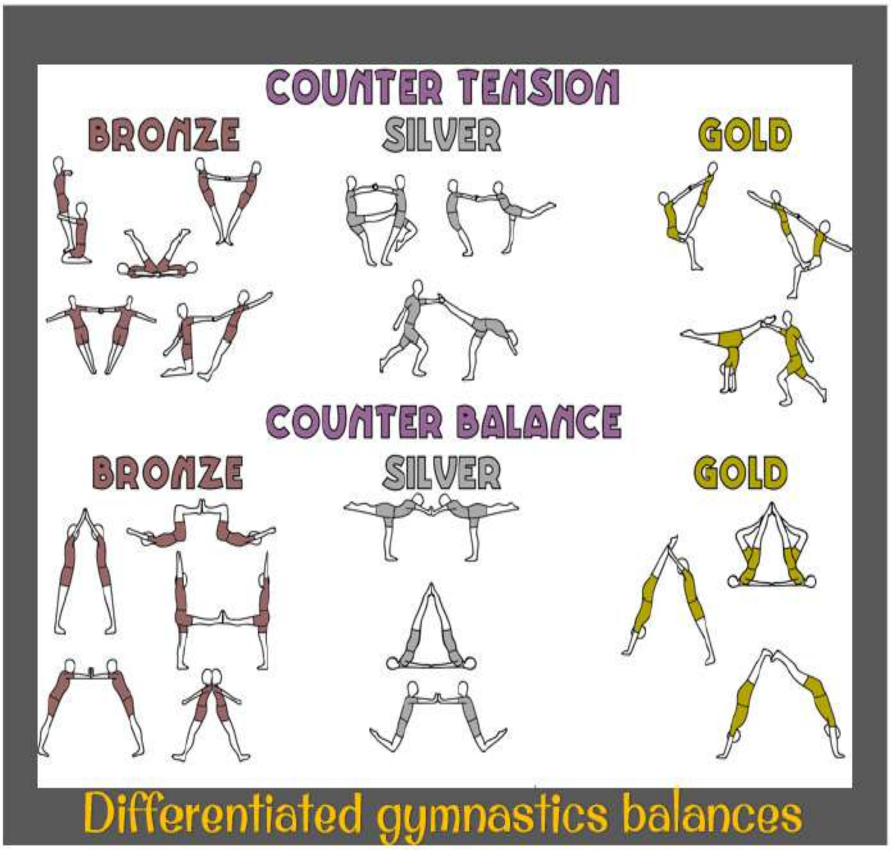
Raise foot and point knee at target

Extend foot towards target (with toes pulled back). Push hips/lower back towards target at the same time.

Keeping knee pointing at target, bring foot back towards body.

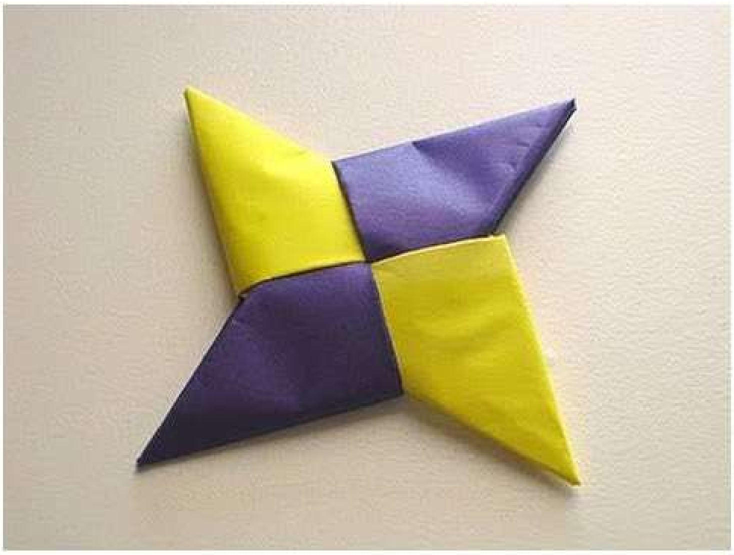
Place foot back where it came from

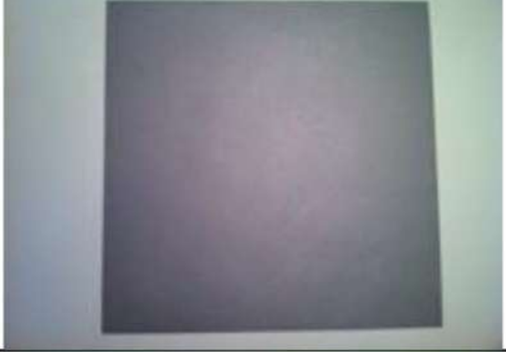
Appendix 12 **Partner counter-balances**

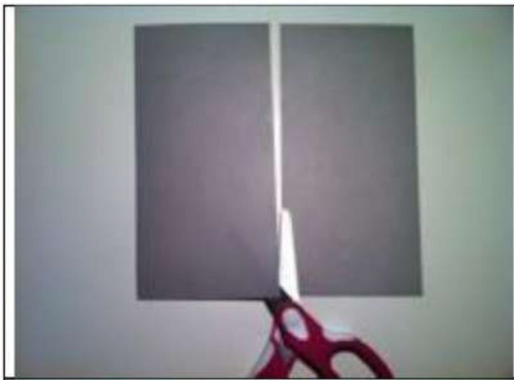


Appendix 13

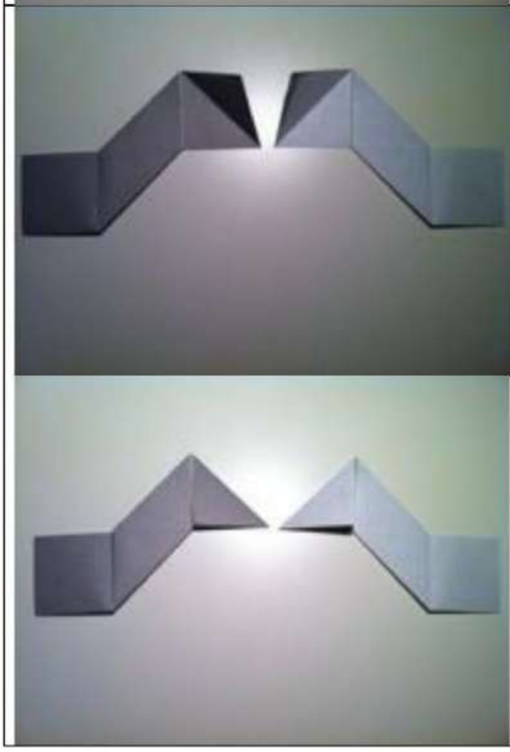
Origami Ninja Stars

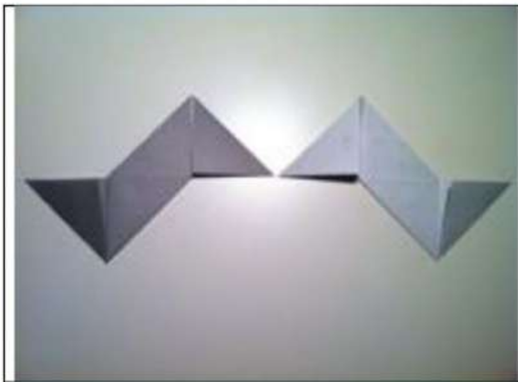
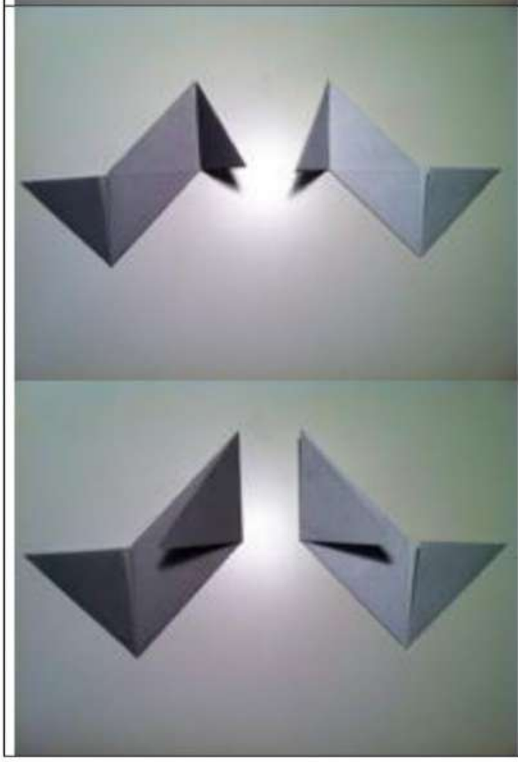


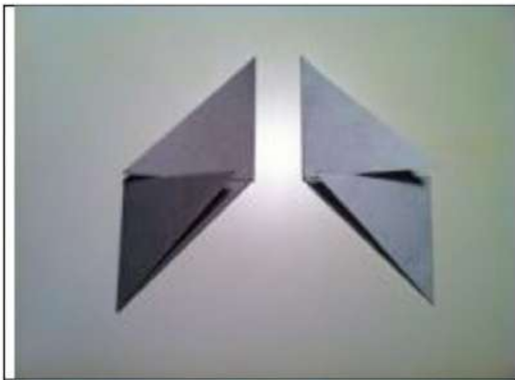
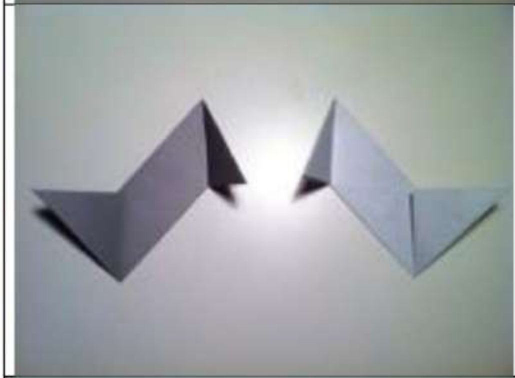
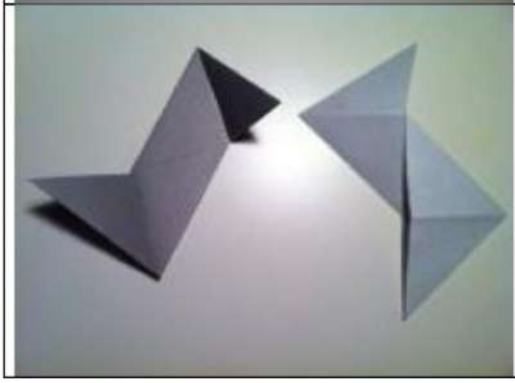
	**Step 1:** Start with a square piece of origami paper.
	**Step 2:** Fold the paper in half, then unfold.

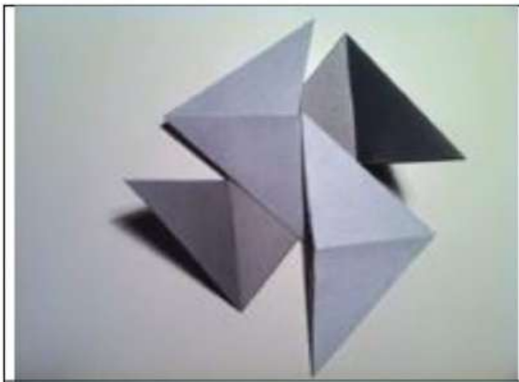
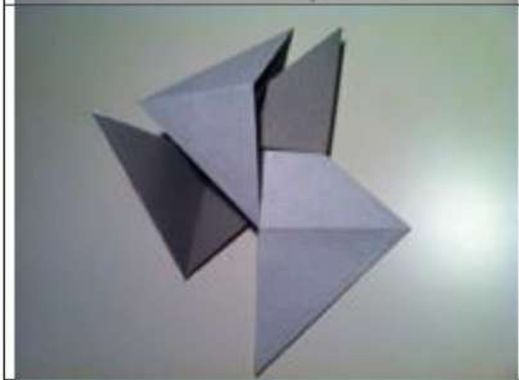
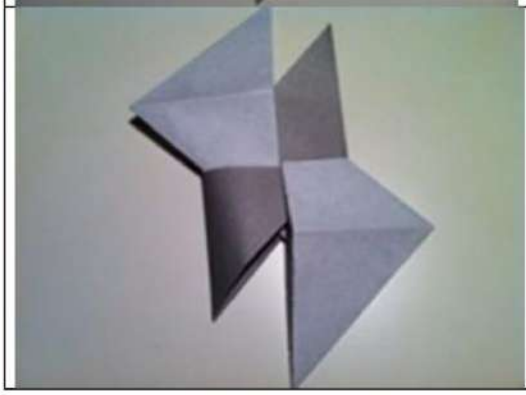
	**Step 3:** Cut in half.
	**Step 4:** Fold the halves in half again so it's thinner.
	**Step 5:** Fold both sheets down in half.

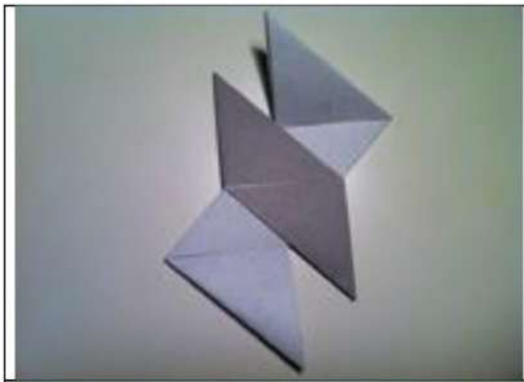
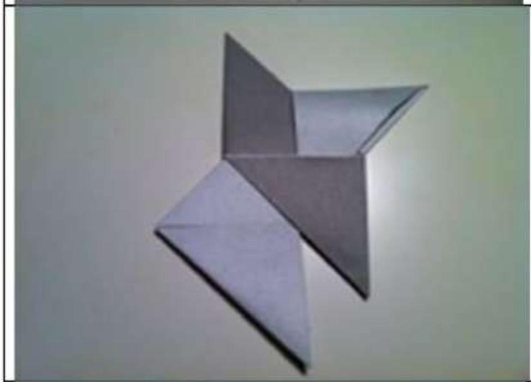
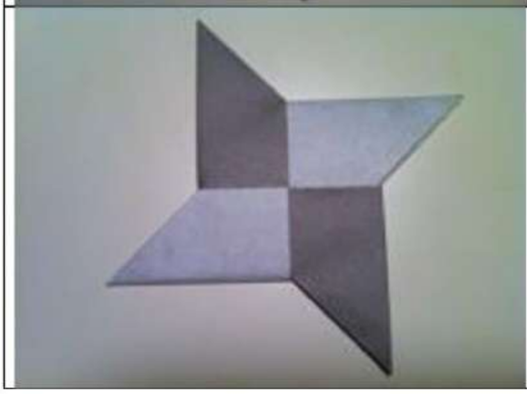
	**Step 6:** Unfold. All we need is the halfway crease.
	**Step 7:** Fold the top half to the side as shown without passing the halfway crease.
	**Step 8:** Fold the lower half of both sheets opposite of the upper half.

	**Step 9:** Turn both paper over so they match the positions as shown
	**Step 10:** Fold the top squares of both sheets in half as shown.

	**Step 11**: Fold the bottom squares of both sheets in half as shown.
	**Step 12:** Fold the top triangles in as shown, but make sure the base of the triangle does not pass the halfway crease

	**Step 13**: Also fold in the bottom triangles of both sheets.
	**Step 14:** Unfold the top and bottom triangles of both sheets.
	**Step 15**: Turn the right sheet over and position it exactly as shown.

	**Step 16:** Place the right sheet on top of the left sheet.
	**Step 17:** Tuck the right flap of the bottom sheet under the left side of the top sheet.
	**Step 18:** Tuck the left flap of the bottom sheet under the right side of the top sheet.

	**Step 19**: Turn the figure over.
	**Step 20**: Tuck the above flap into the pocket of the top sheet.
	**Step 21:** Tuck the lower flap into the other pocket of the top sheet. Finish! Now you're ninja with this 4 point ninja star!

Appendix 14 **Bridge and Roll**

1.

Attacker is in "mount position", defender is on their back

2.

Defender plants toes and shoulders on ground and bridges their hips up high.

3.

Defender's bridge forces attacker to place their hands on the ground to stop from falling forward.

4.

Defender grabs and controls one of the attackers arms and hooks their ankle (on the same side) with their foot.

5.

While maintaining control of the attackers arm and foot, the defender bridges onto their shoulder (the side that is controlling the attackers 2 limbs), simultaneously reaching their other hand diagonally upwards, across the neck/shoulder area of their opponent.

This causes the attacker to fall sideways.

6.

The defender continues to roll until they are on their knees. As good practice (for the attacker), the attacker should immediately lock their ankles around the defenders waist ("closed guard")

Appendix 15 **Scissor sweep from closed guard**

1. Trap your partners arm against your chest with your left arm
2. Cup behind their head with your right hand
3. Turn to the side and hip escape, moving your hips to your right
4. Put your right knee across their chest
5. Put the inside of your left knee against their right knee
6. Scissor your legs and look where you want them to go (left)

Appendix 16 **Guard Pass ("Basic split pass")**

1. Put your right knee on their tailbone

2. Put your hands on your partner's hips and your elbows on their inner thighs

3. Slide your left knee backwards

4. Apply pressure to their hips to pop their guard (if this doesn't work, dig elbow into their thigh)

5. Bring your right knee up to your chest, between their legs

6. Press your right shin down on their right thigh and put your knee on the ground.

7. Lean forward, reach your right hand under their left armpit, and at the same time bring your left leg through.

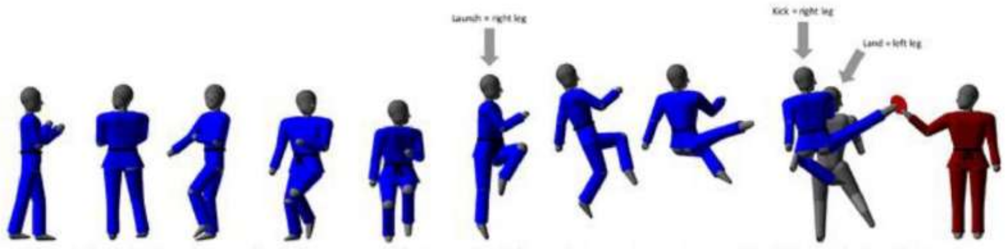
8. Once you have passed their guard, Lay on them with your right knee on their hip and your left knee under their armpit,

9. Hold your own hands with your left going under their head, and the other under their armpit.

Appendix 17 **Jumping Front Kick**

1. The non-kicking leg first rises knee-high into the air.
2. Then you jump using the kicking leg. This gives your body extra upward momentum
3. Then while in the air, you perform a Front Kick. Typically you land on the non-kicking foot.

Appendix 18 **Tornado Kick**



- Start facing forward in the fighting Stance with your target straight in front of you.
- Take a full step forward with your right leg, and face your left
- You're going to be spinning now on your right leg, so your weight should be on the balls of your right foot (not the heel).
- Look back over your left shoulder. Begin to lift your left knee into the air, with the left shin still pointed downward. So at this point you're standing on just your right leg, looking back over your left shoulder.
- While still pivoting on the right leg, crouch a bit on your right leg as your left knee comes around to point at your target. Continue to lift the left knee, to provide additional upward momentum.
- Jump high into the air using just your right leg.
- At the top of your jump, as you're once again facing your target, hit the target with a Roundhouse Kick with your right leg.
- Your right foot should hit the target before you land on your left leg

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Cleary, T., & Ratti, O. (2011). *Code of the Samurai: A Modern Translation of the Bushido Shoshinshu of Taira Shigesuke*. Tuttle Publishing. https://books.google.com.au/books?id=UPfPAgAAQBAJ

Lubans, D. R., Lonsdale, C., Cohen, K., Eather, N., Beauchamp, M. R., Morgan, P. J., Sylvester, B. D., & Smith, J. J. (2017, February 23). Framework for the design and delivery of organized physical activity sessions for children and adolescents: rationale and description of the 'SAAFE' teaching principles [journal article]. *International Journal of Behavioral Nutrition and Physical Activity, 14*(1), 24. https://doi.org/10.1186/s12966-017-0479-x

Massie, M. (2013). *Martial Arts Character Education Lesson Plans for Children* Modern Digital Publishing.

McDonald, T. (2013). *Classroom Management: Engaging Students in Learning* (2 ed.). Oxford University Press. https://books.google.com.au/books?id=Yp81lQEACAAJ

Appendix 2: Kick-Smart Program Participant Information Statement / Consent Forms

Dr Nick Riley

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THE UNIVERSITY OF NEWCASTLE AUSTRALIA

Research Project: Kick-Smart

Document Version 3 (17/5/2019)

PARENT INFORMATION STATEMENT

Dear Parent,

Your child is invited to participate in the research project above which is being conducted by *Mr Louis Burt (Doctoral Researcher)* under the supervision of *Dr Narelle Eather, Dr Nicholas Riley* and *Dr Robert Parkes* from the University of Newcastle. As a PhD candidate, Mr Burt will be supervised and supported by Dr Eather, Dr Parkes, and Dr Riley throughout the project.

Why is this research being done?

Previous studies have demonstrated the potential of mixing physical activity into mathematics lessons to increase students' activity levels and improve students' on-task behaviour, without sacrificing academic performance. Other studies have shown that martial arts programs have had positive effects on children's aggression levels, self-esteem and social behaviour.

Kick-Smart has the potential to change school policy and practice in relation to physical activity and martial arts integration, increase students' school-time physical activity levels and enhance a range of educational outcomes. Additionally there is a growing body of literature linking physical activity with improvements in brain function and understanding. As such, the Kick-Smart study will examine the impact of the program on key measures of executive functioning: attention span, and memory. Additionally, the study will examine the impact of the program on students' competence with basic adding, subtracting, multiplying and dividing, as well as on their physical fitness.

Who can participate in this research?

All children in a selected Stage 3 class will participate in the program as the "test class", while children in another Stage 3 class will act as a control group. Only children who return the parental consent form will have their results used in the data collection aspects of this research. The program will combine Mathematics and PDHPE with martial arts and will be delivered in PE and School Sport time. The control class will continue with their usual PE and Sport lessons while the test class is at the Kick-Smart sessions. The program will run for six weeks starting week 2 of Term 3, 2019. Data to test the potential effectiveness of the intervention (for example, One Minute Basic Fact test) will be collected from students in both the intervention (test class) and control class during Term 3, 2019. The control class will receive a condensed delivery of the intervention in weeks 8-11. The content for the condensed delivery will consist of six sessions taken from the full intervention program. These six sessions have been specifically chosen by the research team to give the control group a good exposure to as much of the Kick-Smart content as possible. Classes will be randomised after base-line data collection in Week 1 of Term 3. Both your child's class and the other class from your school have equal chance of being selected for either the test or the control group. Data will not be collected from the "control group" for the condensed version.

All students in the class will participate in the program, however, only the students who provide signed consent letters will contribute to the study data. If you are interested in participating, you must complete and sign the consent form and return it to your child's school teacher or Principal.

What choice do participants have?

Participation in this research is entirely your choice and only schools where both the principals and teachers have agreed to participate will be included in this study.
If you do agree for your child to participate, you may withdraw from the study at any time without giving a reason. A decision not to participate or decision to withdraw from the study will not jeopardise your relationship with your child's school, or the University of Newcastle. Similarly, students will be included in the study only after a consent form has been signed by you, the parent/guardian.

What is involved in this study?

During the program, students (in the test class) will engage in two, 1-hour session each week, which will include activities and techniques from a range of martial arts including Karate, Boxing, Taekwon-Do and Pankration/MMA. This will include learning basic punches and kicks and practicing them on pads, as well as basic self-defence techniques. The students will **not** be striking each other at any point, however in some classes, controlled physical contact will be necessary. For example:

- Students will learn how to escape simple grabs such as a wrist grab. This will require students to practice this with a partner by holding their partner's wrist and the other to apply the escape technique.

The martial arts program will also include discussions and activities that aim to develop a better understanding of various character/ethic topics such as courage, self-control and teamwork.

Additionally, the content from this project meets many Stage 3 requirements for the NSW Mathematics and the NSW PDHPE syllabi. Mr Burt, and members of the research team, qualified to administer the assessments, will be involved in the delivery of all assessments and the observations of students. Follow up data will be collected in week 8 of Term 3.

Children will complete a range of assessments at baseline (Week 1, Term 3) and follow up (Week 8, Term 3).

What are the potential risks?

There are no risks associated with this project that are not found in a typical physical education lesson. Standard teaching practices will be followed during each lesson, including all safety precautions that would be taken into account in a normal physical education setting.

Who will be teaching the content?

The program will be taught by *Mr Louis Burt*, who is a qualified, practicing Primary School Teacher. Mr Burt is also an accredited martial arts instructor in affiliation with the Martial Arts Industry of Australia (MAIA) [ID No: 2114993]

What are the main Outcomes?

The main outcomes for this study will be **children's social and emotional well-being,** and **children's on-task behaviour** during lessons following the program. Base-line and follow-up data collection will take place during regular class time, with students being taken out in small groups to complete assessments. It is anticipated to take between 60-90 minutes per class,

On-task behaviour within lessons following the program will be assessed using a momentary time sampling procedure. This tool has been adapted from the Behaviour Observation of Students in Schools and the Applied Behaviour Analysis for Teachers. On-Task behaviour will be reported as a percentage of lesson time. Members of the research team will conduct the observations of pupils for 30 min in total (6 children).

Cognition: Student's cognition will be assessed using the following two measures.

The NIH Toolbox Flanker Inhibitory Control and Attention Test: This measures both attention and inhibitory control using an IPad. Students are required to focus on a specific stimulus whilst ignoring the stimuli around it. To achieve this, students are presented with a row of arrows pointing different directions. Students are then required to choose one of two buttons on the screen that matches to the direction in which the middle arrow is pointing. Students are presented with four practices questions before they begin the examination.

The NIH Toolbox Dimensional Change Sort Test: This measures attention and cognitive flexibility. Students are presented with two dimensions (either shape or colour) and are required to answer a series of "Choose either *A* or

B" style questions according to one of the two dimensions (the dimensions change throughout the test). Students are given three practice questions before they begin the examination.

Academic performance: Children's academic performance in Mathematics will be measured using the One Minute Basic Fact test.

Physical activity across the whole week: Students will wear accelerometers (to monitor their level of movement) across the whole week (Monday to Friday). Information from the accelerometer will be analysed using software which provides an accurate analysis of lesson-time and school-time physical activity and sedentary (inactive) behaviour. Accelerometers will only be worn throughout the school day, and will not be taken home.

Physical fitness: Students will participate in a 90° push-up test, 20m repeated shuttle run test, standing broad jump test, and a sit and throw test.

Social and Emotional Well-being: Students will complete the Stirling Children's Wellbeing Scale. The Stirling Children's Wellbeing Scale was developed by the Stirling Council Educational Psychology Service (UK). It is a general, positively worded measure of emotional and psychological well-being in children aged eight to 15 years. The scale aims to provide a way to measure the effectiveness of interventions and projects designed to promote children's well-being and emotional development, such as this one.

How will the information collected be used?

The data collected from the Kick-Smart program will be used for Mr Louis Burt's PhD Thesis, journal publications and conference presentations and to inform future practice for the design of other programs. A summary of the research findings can be provided via email within six months of the end of the program upon request to Nick Riley or any of the research team members.

How will privacy be protected?

Any personal information provided by teachers/students will be confidential to the researchers. The results of the study will be published in general terms and will not allow the identification of individual students, teachers or schools. Once the data has been collected, it will be de-identified, replacing participant names with codes and put into an electronic data file, data collection sheets will be destroyed. Data will be stored for a minimum of 5 years on password protected files (only accessible to researches).

Further information
If you would like further information, please do not hesitate to contact Dr. Nick Riley. Thank you for considering this invitation.

Nick Riley

Dr Nick Riley

Dr Nick Riley

School of Education
Faculty of Education and Arts
University of Newcastle
Callaghan NSW 2308
Phone: + 61 (02) 4985 4254
Email: nicholas.riley@newcastle.edu.au

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 Services, NIER Precinct, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 4921 6333, email Human-Ethics@newcastle.edu.au.
This project has been approved by the University's Ethics committee, Approval number [H-2019-0057]. Prior to commencement of the study that approval from the department of education will be sought.

Parent Consent Form

Dr Nick Riley

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Consent Form for the Research Project:

Kick-Smart

Dr Nicholas Riley, Dr Narelle Eather, Dr Robert Parkes, Mr Louis Burt

Document Version 2 (26/04/2019)

I agree for my child ………………………………………………………… to participate in the above research project and give my consent freely.

I understand that the project will be conducted as described in the Information Statement, a copy of which I have retained.

I understand my child can withdraw from the project at any time, up to the point of publication, and do not have to give any reason for withdrawing.

I understand that this research will be conducted as a feasibility trial. The researchers will recruit 2 classes in total. During Term 3, 2019, one of the classes will be randomly allocated (i.e., by chance) to receive the intervention program. The other class will be a control group who will receive a condensed version of the course during weeks 8-10 of Term 3. Data to test the potential effectiveness of the intervention will be collected from students in both intervention and control classes during Term 3, 2019.

I have had an opportunity to ask the research team questions about the research and have them answered to my satisfaction.

By returning the below form to school, I am indicating my consent for my child to participate in this research project. I am also consenting for the collection of baseline and post intervention data in Term 3, 2019.

Name of school: ________________________________

Parent's name: ________________________________

Child's name: ________________________________

Date: ____________

Parent's signature: ________________________

Child's signature: ________________________

Dr Nick Riley

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Research Project: Kick-Smart

Document Version 3 (17/5/2019)

PRINICIPAL INFORMATION STATEMENT

Dear Principal,

You are invited to participate in the research project identified above which is being conducted by *Mr Louis Burt (Doctoral Researcher)* under the supervision of *Dr Narelle Eather, Dr Nicholas Riley* and *Dr Robert Parkes* from the University of Newcastle. As a PhD candidate, Mr Burt will be supervised and supported by Dr Eather, Dr Parkes, and Dr Riley throughout the project.

Why is this research being done?

Previous studies have demonstrated the potential of integrating physical activity into mathematics lessons to increase students' activity levels and improve students' on-task behaviour, without sacrificing academic performance. Other studies have shown that martial arts programs have had positive effects on children's aggression levels, self-esteem and social behaviour.

Kick-Smart has the potential to change school policy and practice in relation to physical activity and martial arts integration, increase students' school-time physical activity levels and enhance a range of key educational outcomes. Additionally there is a growing body of literature linking physical activity with improvements in brain function and cognition. As such, the Kick-Smart study will examine the impact of the program on key measures of executive functioning: sustained attention, working memory and visual memory. Additionally, the study will examine the impact of the program on the recollection of basic numeracy facts, and physical fitness.

Who can participate in this research?

All NSW Primary School are eligible to participate in the program. All children in a selected class will participate in the program, while children in another class will act as a control group, however, only children from whom a parental consent form has been provided will be involved in the data collection aspects of this research. The program will combine a curriculum-based program with the integration of physical activity and martial arts at school delivered in PE and School Sport time. The control class will continue with their usual PE and Sport lessons. The program will run for six weeks starting week 2 of term 3, 2019. This research will be conducted as a feasibility trial. Data to test the potential effectiveness of the intervention will be collected from students in both intervention and control classes during Term 3, 2019. The control class will receive a condensed delivery of the intervention in weeks 8-10. The content for the condensed delivery will consist of six sessions taken from the full intervention program. These six sessions have been specifically chosen by the research team to give the control group a good exposure to as much of the Kick-Smart content as possible. Classes will be randomised after baseline data collection. Both classes class have equal chance of being selected for either group. Data will not be collected from the "control group" for the condensed version.

All students in the class will participate in the program, however, only the students who provide signed consent letters will contribute to the study data.

What choice do participants have?

Participation in this research is entirely your choice and only schools where both the principals and teachers have agreed to participate will be included in this study.
If you do agree for your school to participate, you may withdraw from the study at any time without giving a reason. A decision not to participate or discontinuation of involvement in the study will not jeopardise your relationship with the University of Newcastle. Similarly, students in your school will be included in the study only after a consent form has been signed by the students' parents/guardians. If they initially agree to participate, they can choose to withdraw from the study at any time without giving a reason.

What is involved in this study?

During the program, students (in the test class) will engage in two, 1-hour sessions each week, which will include activities and techniques from a range of martial arts including Karate, Boxing, Taekwon-Do and Pankration/MMA. This will include learning basic punches and kicks and practicing them on pads, as well as basic self-defence techniques. The students will **not** be striking each other at any point, however in some classes, controlled physical contact will be necessary. For example:

- Students will learn how to escape simple grabs such as a wrist grab. This will require students to practice this with a partner by holding their partner's wrist and the other to apply the escape technique.

The martial arts program will also include discussions and activities that aim to develop a better understanding of various character/ethic topics such as courage, self-control and teamwork.

Additionally, the content from this project meets many Stage 3 requirements for the NSW Mathematics and the NSW PDHPE syllabi. Mr Burt, and members of the research team, qualified to administer the assessment, will be involved in the delivery of all assessments and the observations of pupils. Follow up data will be collected in week 8 of Term 3. Class teacher for the control class will continue with regular class duties and activities. The class teacher for the test class will be required to be present to supervise their class during each Kick-Smart session and manage any behaviour issues during this time.

Teachers' consent should be received in order to be able to deliver the program in their classes and collect data.

Children will complete a range of assessments at baseline (Week 1, Term 3) and follow up (Week 8, Term 3).

What are the potential risks?

There are no risks associated with this project that are not found in a typical physical education lesson. Standard teaching practices will be followed during each lesson, including all safety precautions that would be taken into account in a normal physical education setting.

Who will be teaching the content?

The program will be taught by *Mr Louis Burt*, who is a qualified, practicing Primary School Teacher. Mr Burt is also an accredited martial arts instructor in affiliation with the Martial Arts Industry of Australia (MAIA) [ID No: 2114993].

What are the Primary Outcomes?

The primary outcomes for this study will be **children's social and emotional well-being,** and **children's on-task behaviour** within lessons following the program. Base-line and follow-up data collection will take place during regular class time, with students being taken out in small groups to complete assessments. It is anticipated to take between 60-90 minutes per class,

Children's on task behaviour: This will be assessed using a momentary time sampling procedure. This observational tool has been adapted from the Behaviour Observation of Students in Schools and the Applied Behaviour Analysis for. Classroom behaviour will be reported as a percentage of lesson time. Members of the research team will conduct the observations of pupils for 30 min in total (6 children).

Cognition: Student's cognition will be assessed using the following two measures.

The NIH Toolbox Flanker Inhibitory Control and Attention Test measures both attention and inhibitory control using an IPad. Students are required to focus on a specific stimulus whilst inhibiting attention to the stimuli flanking it. To achieve this, students are presented with a row of arrows pointing different directions. Students are then required to choose one of two buttons on the screen that corresponds to the direction in which the middle arrow is pointing. Students are presented with four practices questions prior to beginning the examination.

The NIH Toolbox Dimensional Change Sort Test measures attention and cognitive flexibility. Students are presented with two dimensions (either shape or colour) and are required to answer a series of bivalent test pictures according to one of the two dimensions (the dimensions are interchangeable). Students are given thee practice trials which are directly followed by the examination

Academic performance: Children's academic performance in Mathematics will be measured using the One Minute Basic Fact test.

Physical activity across the whole week: Students will wear the accelerometers across the whole week (Monday to Friday). Raw data from the accelerometer will be screened and analysed using Meter plus software which allows for time specific analysis to accurately analyse lesson- and school-time physical activity and sedentary behaviour.

Social and Emotional Well-being: Students will complete the Stirling Children's Wellbeing Scale. The Stirling Children's Wellbeing Scale was developed by the Stirling Council Educational Psychology Service (UK). It is a holistic, positively worded measure of emotional and psychological well-being in children aged eight to 15 years. The scale draws on current theories of well-being and Positive Psychology, and aims to provide a means of measuring the effectiveness of interventions and projects designed to promote children's well-being and emotional development, such as this one.

Equipment: The supply of equipment will be discussed with the school upon receipt of the Principal's consent. School equipment will be used as much as possible, however, any necessary equipment not available at the school will be supplied by the University of Newcastle.

How will the information collected be used?

The data collected from the Kick-Smart program will be used for Mr Louis Burt's PhD thesis, journal publications and conference presentations and to inform future practice for the design of valuable, evidence-based education and health-related fitness programs. A summary of the research findings can be provided via email within six months of the end of the program upon request to Nick Riley or any of the research team members.

How will privacy be protected?

Any personal information provided by teachers/students will be confidential to the researchers. The results of the study will be published in general terms and will not allow the identification of individual teachers or schools. Once the data has been collected, it will be de-identified using participant codes and transcribed into an electronic data file, interview data collection sheets will be destroyed. Data will be stored for a minimum of 5 years on password protected files (only accessible to researches).

What do you need to do to participate?

Upon receipt of your consent form via email, a member of the research team will contact you to organise a time to visit the school.

Further information

If you would like further information, please do not hesitate to contact Dr. Nick Riley. Thank you for considering this invitation.

Dr Nick Riley

Dr Nick Riley

School of Education
Faculty of Education and Arts
University of Newcastle
Callaghan NSW 2308
Phone: + 61 (02) 4985 4254
Email: nicholas.riley@newcastle.edu.au

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 Services, NIER Precinct, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 4921 6333, email Human-Ethics@newcastle.edu.au.

This project has been approved by the University's Ethics committee, Approval number [H-2019-0057]. Prior to commencement of the study that approval from the department of education will be sought.

Principal Consent Form

Dr Nick Riley

School of Education
Faculty of Education and Arts
University of Newcastle
Callaghan NSW 2308
Phone: + 61 (02) 4985 4254
Email: nicholas.riley@newcastle.edu.au

Consent Form for the Research Project:

Kick-Smart

Dr Nicholas Riley, Dr Narelle Eather, Dr Robert Parkes, Mr Louis Burt

Document Version 2 (26/04/2019)

I have been given information about the project identified above. I consent to my school participating in the study

I understand that my school will participate in the program in Term 3, 2019.

I understand that this research will be conducted as a feasibility trial. The researchers will recruit 2 classes in total. During Term 3, 2019, one of the classes will be randomly allocated (i.e., by chance) to receive the intervention program. The other class will be a control group who will receive a condensed version of the course during weeks 8-10 of Term 3. Data to test the potential effectiveness of the intervention will be collected from students in both intervention and control classes during Term 3, 2019

I have had an opportunity to ask the research team questions about the research and have them answered to my satisfaction.

I understand that my school's participation in this research is voluntary and that I am free to withdraw from the research project at any time. My refusal to participate or withdrawal of consent will not affect my relationship with the University of Newcastle.

By returning the below form, completed, via email, I am indicating my consent for my school to participate in this research project conducted by Dr Nick Riley. I am also consenting for the collection of baseline and post intervention data in Term 3, 2019.

Name of school:

____

Principal's name: ______________________________________

Mobile: __________________________

Date: ____________

Principal's signature: ___________________________

PLEASE EMAIL COMPLETED SHEET BACK TO Dr Nick Riley

nicholas.riley@newcastle.edu.au

Dr Nick Riley

School of Education
Faculty of Education and Arts
University of Newcastle
Callaghan NSW 2308
Phone: + 61 (02) 4985 4254
Email: nicholas.riley@newcastle.edu.au

Research Project: Kick-Smart

Document Version 3 (17/5/2019)

TEACHER INFORMATION STATEMENT

Dear Teacher,

Your class is invited to participate in the research project identified above which is being conducted by *Mr Louis Burt (Doctoral Researcher)* under the supervision of *Dr Narelle Eather, Dr Nicholas Riley* and *Dr Robert Parkes* from the University of Newcastle. As a PhD candidate, Mr Burt will be supervised and supported by Dr Eather, Dr Parkes, and Dr Riley throughout the project.

Why is this research being done?

Previous studies have demonstrated the potential of integrating physical activity into mathematics lessons to increase students' activity levels and improve students' on-task behaviour, without sacrificing academic performance. Other studies have shown that martial arts programs have had positive effects on children's aggression levels, self-esteem and social behaviour.

Kick-Smart has the potential to change school policy and practice in relation to physical activity and martial arts integration, increase students' school-time physical activity levels and enhance a range of key educational outcomes. Additionally there is a growing body of literature linking physical activity with improvements in brain function and cognition. As such, the KICK-SMART study will examine the impact of the program on key measures of executive functioning: sustained attention, working memory and visual memory. Additionally, the study will examine the impact of the program on the recollection of basic numeracy facts, and physical fitness.

Who can participate in this research?

All children in a selected class will participate in the program, while children in another class will act as a control group, however, only children from whom a parental consent form has been provided will be involved in the data collection aspects of this research. The program will combine a curriculum-based program with the integration of physical activity and martial arts at school delivered in PE and School Sport time. The control class will continue with their usual PE and Sport lessons. The program will run for six weeks starting week 2 of Term 3, 2019. This research will be conducted as a feasibility trial. Data to test the potential effectiveness of the intervention will be collected from students in both intervention and control classes during Term 3, 2019. The control class will receive a condensed delivery of the intervention in weeks 8-10. The content for the condensed delivery will consist of six sessions taken from the full intervention program. These six sessions have been specifically chosen by the research team to give the control group a good exposure to as much of the Kick-Smart content as possible. Classes will be randomised after baseline data collection. Your class has equal chance of being selected for either group. Data will not be collected from the "control group" for the condensed version.

What choice do participants have?

Participation in this research is entirely your choice and only schools where both the principals and teachers have agreed to participate will be included in this study. Your school Principal has agreed to participate in this study. We are now seeking your class participation in the study.

If you do agree to your participation, you may withdraw from the study at any time without giving a reason. A decision not to participate or discontinuation of involvement in the study will not jeopardise any relationship you may have with the University of Newcastle. Similarly, students in your school will be included in the study only after a consent form has been signed by the students and their parents/guardians. If they initially agree to participate, they can choose to withdraw from the study at any time without giving a reason. Only data collected from children for whom parental consent has been given will be included in the analysis.

What is involved in this study?

During the program, students (in the test class) will engage in two, 1-hour sessions each week, which will include activities and techniques from a range of martial arts including Karate, Boxing, Taekwon-Do and Pankration/MMA. This will include learning basic punches and kicks and practicing them on pads, as well as basic self-defence techniques. The students will **not** be striking each other at any point, however in some classes, controlled physical contact will be necessary. For example:

- Students will learn how to escape simple grabs such as a wrist grab. This will require students to practice this with a partner by holding their partner's wrist and the other to apply the escape technique.

The martial arts program will also include discussions and activities that aim to develop a better understanding of various character/ethic topics such as courage, self-control and teamwork.

Additionally, the content from this project meets many Stage 3 requirements for the NSW Mathematics and the NSW PDHPE syllabi. Mr Burt, and members of the research team, qualified to administer the assessment, will be involved in the delivery of all assessments and the observations of pupils. Follow up data will be collected in week 8 of Term 3. Class teacher for the control class will continue with regular class duties and activities. The class teacher for the test class will be required to be present to supervise their class during each Kick-Smart session and manage any behaviour issues during this time.

Teachers' consent should be received in order to be able to deliver the program in their classes and collect data.

Children will complete a range of assessments at baseline (Week 1, Term 3) and follow up (Week 8, Term 3).

What are the potential risks?

There are no risks associated with this project that are not found in a typical physical education lesson. Standard teaching practices will be followed during each lesson, including all safety precautions that would be taken into account in a normal physical education setting.

Who will be teaching the content?

The program will be taught by *Mr Louis Burt*, who is a qualified, practicing Primary School Teacher. Mr Burt is also an accredited martial arts instructor in affiliation with the Martial Arts Industry of Australia (MAIA) [ID No: 2114993].

What are the Primary Outcomes?

The primary outcomes for this study will be **children's social and emotional well-being,** and **children's on-task behaviour** within lessons following the program. Base-line and follow-up data collection will take place during regular class time, with students being taken out in small groups to complete assessments. It is anticipated to take between 60-90 minutes per class,

Children's on task behaviour: This will be assessed using a momentary time sampling procedure. This observational tool has been adapted from the Behaviour Observation of Students in Schools and the Applied Behaviour Analysis for. Classroom behaviour will be reported as a percentage of lesson time. Members of the research team will conduct the observations of pupils for 30 min in total (6 children).

Cognition: Student's cognition will be assessed using the following two measures.

The NIH Toolbox Flanker Inhibitory Control and Attention Test measures both attention and inhibitory control using an IPad. Students are required to focus on a specific stimulus whilst inhibiting attention to the stimuli flanking it. To achieve this, students are presented with a row of arrows pointing different directions. Students are then required to choose one of two buttons on the screen that corresponds to the direction in which the middle arrow is pointing. Students are presented with four practices questions prior to beginning the examination.

The NIH Toolbox Dimensional Change Sort Test measures attention and cognitive flexibility. Students are presented with two dimensions (either shape or colour) and are required to answer a series of bivalent test pictures according to one of the two dimensions (the dimensions are interchangeable). Students are given thee practice trials which are directly followed by the examination

Academic performance: Children's academic performance in Mathematics will be measured using the One Minute Basic Fact test.

Physical activity across the whole week: Students will wear the accelerometers across the whole week (Monday to Friday). Raw data from the accelerometer will be screened and analysed using Meter plus software which allows for time specific analysis to accurately analyse lesson- and school-time physical activity and sedentary behaviour.

Physical fitness: Students will participate in a 90° push-up test, 20m repeated shuttle run test, standing broad jump test, and a sit and throw test.

Social and Emotional Well-being: Students will complete the Stirling Children's Wellbeing Scale. The Stirling Children's Wellbeing Scale was developed by the Stirling Council Educational Psychology Service (UK). It is a holistic, positively worded measure of emotional and psychological well-being in children aged eight to 15 years. The scale draws on current theories of well-being and Positive Psychology, and aims to provide a means of measuring the effectiveness of interventions and projects designed to promote children's well-being and emotional development, such as this one.

How will the information collected be used?

The data collected from the Kick-Smart program will be used for Mr Louis Burt's PhD thesis, journal publications and conference presentations and to inform future practice for the design of valuable, evidence-based education and health-related fitness programs. A summary of the research findings can be provided via email within six months of the end of the program upon request to Nick Riley or any of the research team members via email, face-to-face, or telephone.

How will privacy be protected?

Any personal information provided by teachers/students will be confidential to the researchers. The results of the study will be published in general terms and will not allow the identification of individual teachers or schools. Once the data has been collected, it will be de-identified using participant codes and transcribed into an electronic data file, interview data collection sheets will be destroyed. Data will be stored for a minimum of 5 years on password protected files (only accessible to researches).

What do you need to do to participate?

Upon receipt of your consent form via email, a member of the research team will contact you to organise a time to visit the school.

Further information

If you would like further information, please do not hesitate to contact Dr. Nick Riley. Thank you for considering this invitation.

Nick Riley

Dr Nick Riley

Dr Nick Riley

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Callaghan NSW 2308
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Email: nicholas.riley@newcastle.edu.au

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This project has been approved by the University's Ethics committee, Approval number [H-2019-0057]. Prior to commencement of the study that approval from the department of education will be sought.

Teacher Consent Form

Dr Nick Riley

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THE UNIVERSITY OF NEWCASTLE AUSTRALIA

Consent Form for the Research Project:

Kick-Smart

Dr Nicholas Riley, Dr Narelle Eather, Dr Robert Parkes, Mr Louis Burt

Document Version 2 (26/4/2019)

I have been given information about the project identified above. I consent to my class participating in the study.

I understand that my class will participate in the program in Term 3, 2019.

I understand that this research will be conducted as a feasibility trial. The researchers will recruit 2 classes in total. During Term 3, 2019, one of the classes will be randomly allocated (i.e., by chance) to receive the intervention program. The other class will be a control group who will receive a condensed version of the course during weeks 8-10 of Term 3. Data to test the potential effectiveness of the intervention will be collected from students in both intervention and control classes during Term 3, 2019. I understand that I will need to supervise the class while intervention sessions are being conducted

By returning the below form, completed, via email, I am indicating my consent for my class to participate in this research project conducted by Dr Nick Riley. I am also consenting for the collection of baseline and post intervention data in 2019.

Name of school: ____

Teacher's name: ____

Date: ________________

Teacher's signature: ____

PLEASE EMAIL COMPLETED SHEET BACK TO

Dr Nick Riley

nicholas.riley@newcastle.edu.au

Appendix 3: Kick-Smart Tests and Procedures

Kick-Start Assessment Protocols

Well-being	Stirling Children's Well-being Scale
Academic Performance	The One Minute Basic Number Facts Tests
Cognition	Cognitive Assessment
On-Task Behaviour	Momentary Time Sampling
Fitness	90 Push-Up Test
	20m Repeated Shuttle Run Test
	Standing Broad Jump Test
	Seated Basketball Throw Test
Referencing	

Research Project: Evaluating the efficacy and feasibility of a martial arts-based mathematics intervention program on health, well-being and mathematics ability in primary school students.

Participant Questionnaire

Participant Name: ____________________________

School: ___________________________________

ID: ______________________

To protect your privacy this cover sheet will be removed and destroyed once you have been allocated a study number.

Chief Investigator	Investigators
Dr Narelle Eather The University of Newcastle Faculty of Education & Arts School of Education Phone: (02) 4921 6800 Narelle.Eather@newcastle.edu.au	**Dr Nicholas Riley** **Dr Robert Parkes** **Mr Louis Burt** The University of Newcastle Faculty of Education & Arts School of Education

Here are some statements or descriptions about how you might have been feeling or thinking about things over the past couple of weeks. For each one, please circle the number which best describes your thoughts and feelings;

There are no right or wrong answers.

Statements		Never	Not much of the time	Some of the time	Quite a lot of the time	All of the time
1	I think good things will happen in my life	1	2	3	4	5
2	I have always told the truth	1	2	3	4	5
3	I've been able to make choices easily	1	2	3	4	5
4	I can find lots of fun things to do	1	2	3	4	5
5	I feel that I am good at some things	1	2	3	4	5
6	I think lots of people care about me	1	2	3	4	5
7	I like everyone I have met	1	2	3	4	5
8	I think there are many things I can be proud of	1	2	3	4	5
9	I've been feeling calm	1	2	3	4	5
10	I've been in a good mood	1	2	3	4	5
11	I enjoy what each new day brings	1	2	3	4	5
12	I've been getting on well with people	1	2	3	4	5
13	I always share my sweets	1	2	3	4	5
14	I've been cheerful about things	1	2	3	4	5
15	I've been feeling relaxed	1	2	3	4	5

Academic Performance

Children's academic performance in Mathematics will be assessed using The One Minute Basic Number Facts Tests (1995).

This test will be administered by the research team:

Marking:

1: correct answers

0: wrong answers

Total: number of correct answers

Instruction for administration

- Ensure that the test material has been prepared using a size of type large enough for the children to read easily. If necessary, enlarge the test on a photocopier and, for young children or those with coordination difficulties, considerably increase the space between test items.
- Administer at most only two tests at a time, with a break (e.g. recess) between the addition/subtraction tests and the multiplication/division tests. The multiplication and division tests would not normally be given to children below the age of seven years.
- Place the test sheet face down on the children's tables.
- The children write their name on the back of the sheet.
- You will later need to check the children's age in years and months.
- Say: `When you turn over the page you will find some addition (etc.) questions.
- When I say "start now" I want you to write down the answer to each question as quickly as you can. Don't worry if you don't finish them all.
- Work down the page.
- Pencils ready. Now turn over the page. Find the addition (adding) questions.'
- As soon as the children are ready, say `Start now'.
- After exactly one minute say `Stop! Pencils down'.
- Repeat the procedure for the subtraction, multiplication and division tests.
- Say `Don't forget, this is subtraction. You are taking the number away this time. One minute, starting now', or similar for the corresponding test.
- After one minute say `Stop! Pencils down'.

Cognitive Outcomes

The modified Eriksen flanker task will provide a measure of cognitive control. The Dimensional Change Card Sort Test is a measure of cognitive flexibility and attention.

Ipad: Entering information:

Add new participant

1. ID number (see checklist, e.g., 1)
2. Initials (e.g., John Smith = JS)
3. Choose gender
4. Include children's birthdate (if they don't know, include at least the month and year – or ask the teacher)
5. Highest Education Complete (e.g., Grade 4)
6. Mother's, Father's, Legal Guardian's Education: Unknown
7. Handedness: choose left or right
8. Race: White
9. Ethnicity: Hispano or Latino

Add New Assessment:

Add instrument: Kick-Smart (then press "**Done**" – top right)

When finished: press **Start** (top right)

- **NIH Toolbox Flanker Inhibitory Control and Attention Test**

The NIH Toolbox Flanker Inhibitory Control and Attention Test is a measure of inhibitory control and attention. The Flanker requires the participant to focus on a particular stimulus while inhibiting attention to the stimuli flanking it.

Equipment and materials needed: ipad, Home Base

Detailed information on equipment and materials needed for all tests can be found in Appendix i.

Younger participants first see a fish flanked by two other fish on each side. If they perform well enough, they continue to a version with an arrow flanked by other arrows on each side.

Older participants (ages 8-85 years) are always presented with arrows instead of fish.

All participants are instructed to choose one of two buttons on the screen that corresponds to the direction in which the MIDDLE fish or arrow is pointing.

On congruent trials, all the fish or arrows are pointing in the same direction. On incongruent trials, the flanking fish or arrows are pointing in the opposite direction of the middle fish or arrow. Congruent and incongruent trials are mixed.

The word middle appears on the screen for all participants; for younger participants (ages 3-11), an audio recording also says "MIDDLE," to remind participants where to focus (a star in the middle of the screen).

All the instructions are on the iPad screen. The examiner reads them to and/or with the participant and points out the relevant aspects of the stimuli on the screen.

There are two versions of this measure for ages 3-7. The first is the standard NIH Toolbox Flanker test for ages 3-7. The second is an experimental version (with "developmental extension," or DEXn that was designed to extend the range of assessment downward, for those participants who have difficulty understanding the standard task. Both versions yield a score for the standard measure, and the DEXT version provides simple raw scores and percentages for the experimental items.

Standard administration (all ages):

Practice items

In this version, all participants are first presented with four practice trials. If the participant responds incorrectly, an audio recording provides feedback and highlights the correct choice. Similarly, a separate audio file plays each time the participant gets a practice item correct. Participants must get at least three out of four practice trials correct to advance to the test items. If these participants get fewer than three out of four practice trials correct, they can complete up to two more sets of four practice trials, with the same cutoff to advance to the test trials.

This table outlines the item content read by as well as the actions for the examiner.

	iPad screen written content	Examiner (E) Action
Title Screen	NIH Toolbox FL 12+	E touches and holds button to continue.
Home Base Introductions	In this task, you will see a row of arrows pointing different ways. But first, we are going to learn about Home Base. This is your Home Base. Put your finger on Home Base and wait for the next picture.	E reads screen and points to the home base; then touches and holds button to continue.
Practice Introduction	You will see a row of arrows. You should choose the button that matches the way the MIDDLE arrow is pointing.	E points to left arrow and demonstrates touching the correct arrow.
	If the MIDDLE arrow is pointing this way, choose this button.	E demonstrates touching arrow button.
	If the MIDDLE arrow is pointing this way, choose this button.	E demonstrates touching arrow button.
	Sometimes all the arrows will point the same way. Sometimes the middle arrow will point a different way, like this. You should always choose the button that matches the way the MIDDLE arrow is pointing. You will see the word MIDDLE to remind you.	E reads screen, points to the arrows, and demonstrates touching arrow button.
Transition to practice items	Now you try. Keep your eyes on the star. ⋆ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Remember, put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.
Practice Items set 1	4 practice items	
More practice, if less than 3 out of 4 correct on set 1	Let's practice some more. If the MIDDLE arrow is pointing this way, choose this button.	E reads screen and demonstrates touching arrow button.
	If the MIDDLE arrow is pointing this way, choose this button.	E demonstrates touching arrow button.
Transition to more practice items	Now you try. Keep your eyes on the star. ⋆ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Remember, put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.

- **NIH Toolbox Dimensional Change Card Sort Test (DCCS)**

The NIH Toolbox Dimensional Change Card Sort Test is a measure of cognitive flexibility and attention. Two target pictures are presented that vary along two dimensions (e.g., shape and color). Participants are asked to match a series of bivalent test pictures (e.g., yellow balls and blue trucks) to the target pictures, first according to one dimension (e.g., color) and then, after a number of trials, according to the other dimension (e.g., shape).

The relevant dimension for sorting is indicated by a cue word (e.g., "shape" or "color") that appears on the screen for all participants and that, for young children ages 3-11, is also spoken by a prerecorded audio file.

Equipment and materials needed: ipad, Home Base

Detailed information on equipment and materials needed for all tests can be found in Appendix 4.

Practice items use white and brown colors and a Rabbit and Sailboat as shapes. Test items use blue and yellow colors and a Ball and Truck as shapes.

All instructions are on the IPad screen: The examiner reads them to and/or with the participant and points out the relevant aspects of the stimuli on the screen. The next screen appears when either the examiner or participant makes a choice.

There are two versions of this measure for ages 3-7. The first is the standard NIH Toolbox DCCS test for ages 3-7. The second is an experimental version (with "developmental extension," or DEXT) that was designed to extend u,e range of assessment dc'. .. m·:ard, fer those participants who have difficulty understanding the standard task. Both versions yield a score for the standard measure, and the DEXT version provides simple raw scores and percentages for the experimental items.

Standard administration:

Practice Items:

- Participants must get at least three out of four practice trials correct to advance to the practice trials for the next dimension and then to the test trials.
- If a participant of any age gets fewer than three out of four practice trials correct, he/she will complete up to two more sets of four practice trials, with the same cutoff to advance to the test trials.
- If a participant of any age does not meet the cutoff, the task will automatically discontinue.

If the participant does not respond after five seconds, the examiner should prompt him/her, saying: Choose one of the pictures.

	iPad screen written content	Examiner (E) Actions
correct on set 2		
	If it's a RABBIT, choose that picture.	E chooses RABBIT.
Shape Practice set 3	4 items sorted by shape	
	Test ends, if less than 3 out of 4 correct on set 3	
COLOR intro	We can also match by COLOR. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's BROWN, choose this picture.	E points to, then chooses, BROWN picture.
	If it's WHITE, choose that picture.	E points to, then chooses, WHITE picture.
Transition	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
Color Practice set 1	4 items sorted by color	
More practice, if less than 3 out of 4 correct on set 1	Let's practice some more. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's WHITE, choose this picture.	E chooses WHITE picture.
	If it's BROWN, choose that picture.	E chooses BROWN picture.
Transition	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
Color Practice set 2	4 items sorted by color	
More practice, if less than 3 out of 4 correct on set 2	Let's practice some more. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's WHITE, choose this picture.	E chooses WHITE picture.
	If it's BROWN, choose that picture.	E chooses BROWN picture.
Transition	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
Color Practice set 3	4 items sorted by color	
	Test ends, if less than 3 out of 4 correct on set 3	

On-Task Behaviour

On-task behaviour within Mathematics lessons will be assessed using a momentary time sampling procedure. This observational tool has been adapted from the Behaviour Observation of Students in Schools (Shapiro & Cole, 1994) and the Applied Behaviour Analysis for Teachers (Alberto & Troutman, 2003). Classroom behaviour will be reported as a percentage of lesson time. Trained research assistant will conduct the observations of pupils for 30 min in total (6 children).

Kick-Smart Momentary Time Sampling Observation Form

Observer: ________________

Date: ____________

Time Start: ________

Time End: _________

Class: ____________

Time period(15 second intervals)	Child A	Child B	Child C	Child D	Child E	Child F
00.15-1.30	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP
1.45-3.00	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP
3.15.4.30	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP
4.45-6.00	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP

6.15-7.30	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP
7.45-9.00	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP
9.15-10.30	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP
10.45-12.00	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP
12.15-13.30	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP
13.45-15.00	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP
15.15-16.30	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP
16.45-18.00	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP
18.15-19.30	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP

19.45-21.00	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP
21.15-22.30	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP
22.45-24.00	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP
24.15-25.30	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP
25.45-27.00	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP
27.15-28.30	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP
28.45-30.00	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP	AE PE OM OV OP

Adapted from: Alberto.P and Troutman.A (2003) Applied Behaviour Analysis for Teachers-6th edition, Pearson Education, Australia.

Observer Code

AE Actively engaged: Children are carefully listening to the teacher and are actively involved.

PE Passively engaged: Children are not disturbing the class but they are not doing what the teacher has asked.

OM Off task motor: Children are moving around the class while they shouldn't.

OV Off Task Verbal: Children are chatting with each other.

OP Off task passive: Children are "staring into space".

Marking: Raw Score

_ /20 AE

_ /20 PE

_ / Off- task behaviour

Converting Answers to Percentages

Raw Score	Percentage	Raw Score	Percentage
1	5%	**11**	55%
2	10%	**12**	60%
3	15%	**13**	65%
4	20%	**14**	70%
5	25%	**15**	75%
6	30%	**16**	80%
7	35%	**17**	85%
8	40%	**18**	90%
9	45%	**19**	95%
10	50%	**20**	100%

90° Push-Up (Welk & Merideth, 2008)

- The 90° push-up to an elbow angle of 90° is the recommended test for upper body strength and endurance. Test administration requires little or no equipment; multiple students may be tested at one time, and few zero scores result. This test also teaches students an activity that can be used throughout life as a conditioning activity as well as in self-testing. The 90° push-up has generally been shown to produce consistent scores but reliability depends on how it is administered.

PHOTO 7.7 Starting position for the 90° push-up

Test Objective

- To complete as many 90° push-ups as possible at a rhythmic pace.

Equipment and Facilities

- The only equipment necessary is an audiotape with the recorded cadence or a metranome. The correct cadence is 20 90° push-ups per minute (1 90° push-up every 3 seconds).

Test Instructions

- The student being tested assumes a prone position on the mat with hands placed under or slightly wider than the shoulders, fingers stretched out, legs straight and slightly apart, and toes tucked under. The student pushes up off the mat with the arms until arms are straight, keeping the legs and back straight. The back should be kept in a straight line from head to toes throughout the test (photo 7.7). The student then lowers the body using the arms until the elbows bend at a 90° angle and the upper arms are parallel to the floor (photo 7.8). This movement is repeated as many times as possible. The student should push up and continue the movement until the arms are straight on each repetition. The rhythm should be approximately 20 90° push-ups per minute or 1 90° push-up every 3 seconds.

When to Stop

- Students are stopped when the second form correction (mistake) is made. Only one form correction is allowed.

Form Corrections

- Stopping to rest or not maintaining a rhythmic pace
- Not achieving a 90° angle with the elbow on each repetition
- Not maintaining correct body position with a straight back
- Not extending arms fully

PHOTO7.8 Student in the "down" position for 90° push-up test.

SCORING

The score is the number of 90° push-ups performed. For ease in administration, it is permissible to count the first incorrect 90° push-up. It is important to be consistent with all

20m repeated shuttle run test (maximal effort test)

- The 20m Shuttle Run Test provides percentile scores for students aged 11-14 years. It is an international test adopted by the Australian Institute of Sport. The Australian Fitness Education Award provides standards to be achieved for students aged 9-18 years (ACHPER, 2004).

Student Objective

To run back and forth between two lines, 20m apart, within a set time limit. Running speed is increased by 0.5km/hr each minute using the 20m Shuttle Run Test cadence CD.

Notes

- The test requires maximal effort.
- The shuttles increase progressively - students are required to run until they can no longer keep up with the speed set by the tape.
- Students should not be discouraged if they finish earlier than others.
- Do not push students to exhaustion.

Interpretation of Results

- A score of 4.1 indicates a student has run one shuttle at Level 4. Record the level and the number of shuttles into that level.
- Scores should be compared with the appropriate sex and age related standards (see below).
- Students scoring at or above the set standard are considered to have the level of cardiorespiratory endurance needed to gain health benefits. These students should be encouraged to maintain or increase their cardiorespiratory endurance.
- Students scoring below the standard need to increase their cardiorespiratory endurance towards the criterion based standard.
- A low score may be determined by numerous factors. These include: aerobic capacity, growth, inability to pace, running/walking efficiency, unknown injury, motivation and environmental conditions.

Criterion-based Standards - (level & shuttle) - PAZ 1

Age	9	10	11	12	13	14	15	16	17	18
M	3.4	3.6	5.1	5.4	5.9	6.6	7.8	8.5	8.5	8.5
F	2.7	3.4	3.5	" 4.1	4.3	5.1	5.3	5.5	5.5	5.5

Criterion-based Standards - (level & shuttle) - PAZ 2

Age	9	10	11	12	13	14	15	16	17	18
M	4.1	4.6	6.0	6.4	6.6	7.5	8.8	9.3	9.6	9.6
F	3.4	3.9	4.4	4.8	5.3	5.7	6.0	6.3	6.6	6.6

Criterion-based Standards - (level & shuttle) - PAZ 3

Age	9	10	11	12	13	14	15	16	17	18
M	4.8	5.6	6.9	7.4	8.1	8.4	9.8	10.1	10.7	10.7
F	4.1	4.4	5.3	5.5	6.1	6.3	6.7	7.1	7.7	7.7

Standing broad jump test (muscular fitness lower limb [3,4]

Purpose:

To evaluate explosive strength of the lower limb body muscles

Student Objectives:

To jump as far as possible using a double foot jump from a standing / static start.

Equipment:

* Measuring tape

* Chalk / tape to mark starting line

Procedure

1) The athlete stands behind a line marked on the ground with feet slightly apart. A two foot take-off and landing is used, with swinging of the arms and bending of the knees to provide forward drive. The subject attempts to jump as far as possible, landing on both feet without falling backwards. The start of the jump must be from a static position.

2) The result will be recorded in metres.

3) A non-slip hard surface, chalk and a tape measure are used to perform the test.

4) 2 attempts will be performed with the longest jump being recorded. The measurement is taken from take-off line to the nearest point of contact on the landing (back of the heels).

Seated Basketball Throw Test

Purpose:

To evaluate explosive strength of the upper body muscles

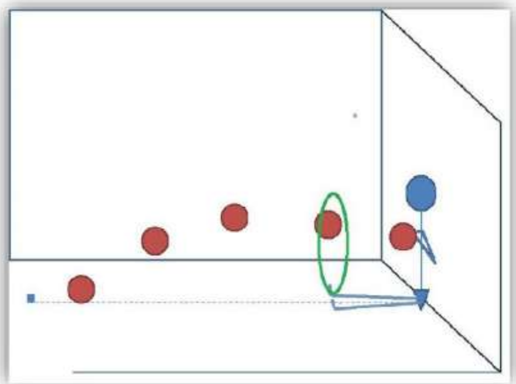
Student Objectives:

To throw the basketball as far as possible using a chest pass from a static start.

Equipment:

* Measuring tape * Basketball * Chalk / tape to mark * Wall

Procedure



1. The participant sits on the floor with their buttocks, back, shoulders and head remaining against the wall and their legs straight with feet together.
2. An assistant places a hoop on top of the participant's toes and the participant assumes the chest pass position with elbows touching the wall.
3. The participant will perform a two-handed chest pass through the hoop
4. the distance from the wall to the ball's first point of contact on the ground is measured in metres (m).
5. Each participant performs two trials.

(Brumitt, Meira, En Gilpin, & Christiansen, 2011)

Referencing:

ACHPER. (2004). *Australian Fitness Education Award: Teacher's Handbook and Curriculum Ideas* (2nd ed.). South Australia: The Australian Council of Health Physical Education and Recreation.

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Mackenzie, B. (2005). *Performance evaluation tests*. London: Electric Word.

Shapiro, E. S., & Cole, C. L. (1994). *Behavior Change in the Classroom: Self-management Interventions*: Guilford Publications.

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Appendix 4: One Minute Basic Number Fact Test

Appendix

The One Minute Basic Number Facts Tests (1995)

The *One Minute Basic Number Facts Tests* are based on the performance of students in South Australian government schools in 1995. All scores in the norm tables have been rounded to the nearest 0.5 or nearest whole number.

In the norm tables the 'normal range' column indicates the range of scores within which roughly 50% of the students in that particular age group would score. This range has been determined by using ±.68 standard deviation.

The 'critically low score' has been calculated from one standard deviation below the mean for the age group. Scores below this critical level place a student in approximately the bottom 16% of students in that age group.

The test-retest reliability of the One Minute Basic Number Facts Tests ranges from .88 to .94 according to age level.

Instruction for administration

- Ensure that the test material has been prepared using a size of type large enough for the children to read easily. If necessary, enlarge the test on a photocopier and, for young children or those with coordination difficulties, considerably increase the space between test items.
- Administer at most only two tests at a time, with a break (e.g. recess) between the addition/subtraction tests and the multiplication/division tests. The multiplication and division tests would not normally be given to children below the age of seven years.
- Place the test sheet face down on the children's tables.
- The children write their name on the back of the sheet.
- You will later need to check the children's age in years and months.
- Say:

  'When you turn over the page you will find some addition (etc.) questions.

  When I say "start now" I want you to write down the answer to each question as quickly as you can. Don't worry if you don't finish them all.

  Work down the page.

  Pencils ready. Now turn over the page.

  Find the addition (adding) questions.'

  As soon as the children are ready, say 'Start now'.
- After exactly one minute say '**Stop!** Pencils down'.
- Repeat the procedure for the subtraction test.
- Say 'Don't forget, this is subtraction. You are taking the number away this time. One minute, starting now'.
- After one minute say '**Stop!** Pencils down'.

One Minute Tests of Basic Number Facts

Addition	Subtraction	Multiplication	Division
2 + 1 =	2 – 1 =	1 x 2 =	2 ÷ 1 =
1 + 4 =	5 – 1 =	2 x 3 =	4 ÷ 2 =
2 + 2 =	3 – 2 =	2 x 5 =	3 ÷ 1 =
4 + 2 =	5 – 3 =	1 x 4=	6 ÷ 3 =
3 + 4 =	6 – 2 =	3 x 2 =	8 ÷ 2 =
2 + 3 =	2 – 2 =	4 x 3 =	9 ÷ 3 =
5 + 2 =	6 – 4 =	9 x 1 =	10 ÷ 2 =
4 + 5 =	7 – 2 =	6 x 2 =	12 ÷ 3 =
3 + 5 =	6 – 1 =	3 x 4 =	15 ÷ 5 =
2 + 8 =	7 – 3 =	5 x 3 =	16 ÷ 4 =
4 + 4 =	8 – 2 =	7 x 2 =	18 ÷ 3 =
2 + 5 =	7 – 5 =	3 x 6 =	20 ÷ 4 =
3 + 3 =	6 – 6 =	2 x 8 =	21 ÷ 3 =
1 + 8 =	8 – 3 =	4 x 5 =	24 ÷ 4 =
6 + 4 =	7 – 4 =	9 x 2 =	30 ÷ 3 =
3 + 7 =	9 – 3 =	3 x 7 =	30 ÷ 5 =
6 + 3 =	8 – 5 =	6 x 4 =	24 ÷ 8 =
5 + 5 =	9 – 5 =	3 x 9 =	27 ÷ 3 =
1 + 5 =	9 – 9 =	8 x 3 =	50 ÷ 5 =
6 + 2 =	10 – 4 =	7 x 0 =	28 ÷ 4 =
2 + 7 =	9 – 4 =	8 x 4 =	32 ÷ 8 =
4 + 6 =	10 – 3 =	5 x 6 =	35 ÷ 5 =
5 + 7 =	11 – 2 =	4 x 7 =	42 ÷ 6 =
8 + 3 =	10 – 6 =	8 x 6 =	45 ÷ 5 =
4 + 9 =	12 – 3 =	7 x 5 =	48 ÷ 8 =
7 + 6 =	12 – 6 =	9 x 4 =	54 ÷ 6 =
6 + 6 =	15 – 5 =	8 x 9 =	36 ÷ 9 =
8 + 6 =	11 – 5 =	7 x 7 =	56 ÷ 7 =
9 + 8 =	13 – 3 =	6 x 9 =	64 ÷ 8 =
6 + 9 =	12 – 9 =	8 x 8 =	63 ÷ 9 =
8 + 7 =	14 – 6 =	6 x 8 =	72 ÷ 8 =
9 + 5 =	17 – 8 =	9 x 9 =	81 ÷ 9 =
9 + 7 =	16 – 9 =	9 x 7 =	88 ÷ 8 =

Norm tables for the basic number facts tests

Addition

Age (years)	Average score	Normal range	Critically low score
6.0	4.0	2 – 6	0
6.5	5.5	3 – 7	2
7.0	8.0	5 – 11	3
7.5	11.0	7 – 15	5
8.0	12.0	8 – 16	6
8.5	15.5	11 – 19	9
9.0	17.0	13 – 21	10
9.5	18.5	14 – 22	11
10.0	20.5	16 – 24	13
10.5	21.5	16 – 26	14
11.0	23.5	20 – 27	18

Subtraction

Age (years)	Average score	Normal range	Critically low score
6.0	3.0	1 – 5	0
6.5	4.0	2 – 6	1
7.0	6.5	3 – 9	2
7.5	8.0	5 – 11	3
8.0	9.0	6 – 12	4
8.5	12.0	8 – 16	6
9.0	13.0	9 – 17	7
9.5	15.0	11 – 19	8
10.0	16.5	12 – 21	10
10.5	18.0	13 – 23	11
11.0	21.0	17 – 25	14

Multiplication

Age (years)	Average score	Normal range	Critically low score
7.5	4.0	1 – 7	0
8.0	5.5	3 – 8	2
8.5	8.5	5 – 11	3
9.0	9.0	6 – 12	4
9.5	11.5	7 – 15	5
10.0	13.0	9 – 17	7
10.5	15.0	10 – 20	8
11.0	17.0	13 – 21	11

Division

Age (years)	Average score	Normal range	Critically low score
7.5	2.5	0 – 4	0
8.0	3.0	1 – 5	0
8.5	5.0	2 – 8	1
9.0	6.0	3 – 9	1
9.5	7.0	3 – 11	2
10.0	9.0	5 – 13	3
10.5	11.0	6 – 16	3
11.0	13.0	8 – 18	5

Appendix 5: Kick-Smart baseline assessment document - Stirling Children's Well-Being Scale & One Minute Basic Number Facts Tests

KICK-SMART

BISHOP TYRRELL

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

TERM 3 – 2019

BASELINE ASSESSMENTS: STIRLING CHILDREN'S WELL-BEING SCALE, & ONE MINUTE BASIC NUMBER FACTS TESTS

NAME:

………………………………………………………………………

CLASS:

………………………………………………………………………

DATE OF BIRTH:

………………………………………………………………………

Appendix 1. The Stirling Children's Well-being Scale (SCWBS)

Here are some statements or descriptions about how you might have been feeling or thinking about things over the past couple of weeks. For each one, please circle the number which best describes your thoughts and feelings; there are no right or wrong answers.

	Statements	Never	Not much of the time	Some of the time	Quite a lot of the time	All of the time
1	I think good things will happen in my life	1	2	3	4	5
2	I have always told the truth	1	2	3	4	5
3	I've been able to make choices easily	1	2	3	4	5
4	I can find lots of fun things to do	1	2	3	4	5
5	I feel that I am good at some things	1	2	3	4	5
6	I think lots of people care about me	1	2	3	4	5
7	I like everyone I have met	1	2	3	4	5
8	I think there are many things I can be proud of	1	2	3	4	5
9	I've been feeling calm	1	2	3	4	5
10	I've been in a good mood	1	2	3	4	5
11	I enjoy what each new day brings	1	2	3	4	5
12	I've been getting on well with people	1	2	3	4	5
13	I always share my sweets	1	2	3	4	5
14	I've been cheerful about things	1	2	3	4	5
15	I've been feeling relaxed	1	2	3	4	5

One Minute Tests of Basic Number Facts

Addition	Subtraction	Multiplication	Division
2 + 1 =	2 – 1 =	1 x 2 =	2 ÷ 1 =
1 + 4 =	5 – 1 =	2 x 3 =	4 ÷ 2 =
2 + 2 =	3 – 2 =	2 x 5 =	3 ÷ 1 =
4 + 2 =	5 – 3 =	1 x 4=	6 ÷ 3 =
3 + 4 =	6 – 2 =	3 x 2 =	8 ÷ 2 =
2 + 3 =	2 – 2 =	4 x 3 =	9 ÷ 3 =
5 + 2 =	6 – 4 =	9 x 1 =	10 ÷ 2 =
4 + 5 =	7 – 2 =	6 x 2 =	12 ÷ 3 =
3 + 5 =	6 – 1 =	3 x 4 =	15 ÷ 5 =
2 + 8 =	7 – 3 =	5 x 3 =	16 ÷ 4 =
4 + 4 =	8 – 2 =	7 x 2 =	18 ÷ 3 =
2 + 5 =	7 – 5 =	3 x 6 =	20 ÷ 4 =
3 + 3 =	6 – 6 =	2 x 8 =	21 ÷ 3 =
1 + 8 =	8 – 3 =	4 x 5 =	24 ÷ 4 =
6 + 4 =	7 – 4 =	9 x 2 =	30 ÷ 3 =
3 + 7 =	9 – 3 =	3 x 7 =	30 ÷ 5 =
6 + 3 =	8 – 5 =	6 x 4 =	24 ÷ 8 =
5 + 5 =	9 – 5 =	3 x 9 =	27 ÷ 3 =
1 + 5 =	9 – 9 =	8 x 3 =	50 ÷ 5 =
6 + 2 =	10 – 4 =	7 x 0 =	28 ÷ 4 =
2 + 7 =	9 – 4 =	8 x 4 =	32 ÷ 8 =
4 + 6 =	10 – 3 =	5 x 6 =	35 ÷ 5 =
5 + 7 =	11 – 2 =	4 x 7 =	42 ÷ 6 =
8 + 3 =	10 – 6 =	8 x 6 =	45 ÷ 5 =
4 + 9 =	12 – 3 =	7 x 5 =	48 ÷ 8 =
7 + 6 =	12 – 6 =	9 x 4 =	54 ÷ 6 =
6 + 6 =	15 – 5 =	8 x 9 =	36 ÷ 9 =
8 + 6 =	11 – 5 =	7 x 7 =	56 ÷ 7 =
9 + 8 =	13 – 3 =	6 x 9 =	64 ÷ 8 =
6 + 9 =	12 – 9 =	8 x 8 =	63 ÷ 9 =
8 + 7 =	14 – 6 =	6 x 8 =	72 ÷ 8 =
9 + 5 =	17 – 8 =	9 x 9 =	81 ÷ 9 =
9 + 7 =	16 – 9 =	9 x 7 =	88 ÷ 8 =

Appendix 6: Kick-Smart baseline assessment document – Trail Making Test

KICK-SMART

BISHOP TYRRELL

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

TERM 3 – 2019

BASELINE ASSESSMENTS: TRAIL MAKING TEST

NAME:

……………………………………………………………………………

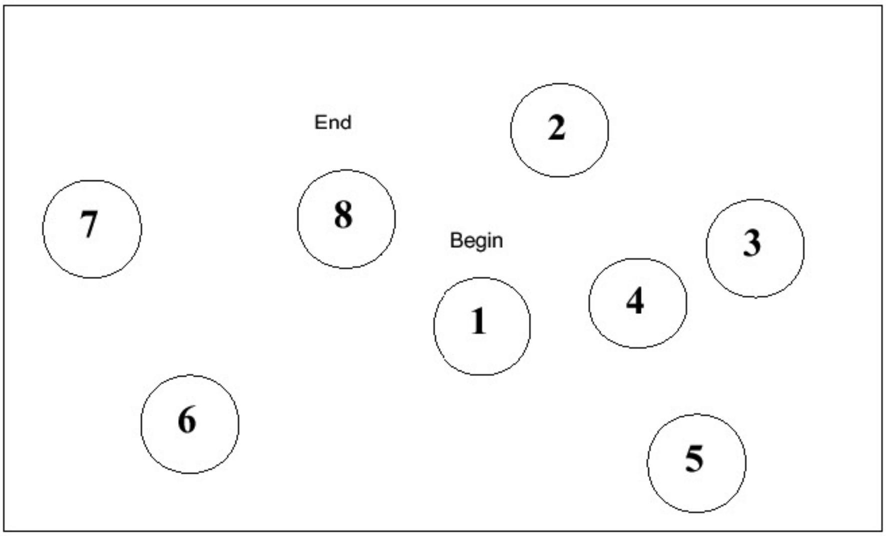
CLASS:

……………………………………………………………………………

DATE OF BIRTH:

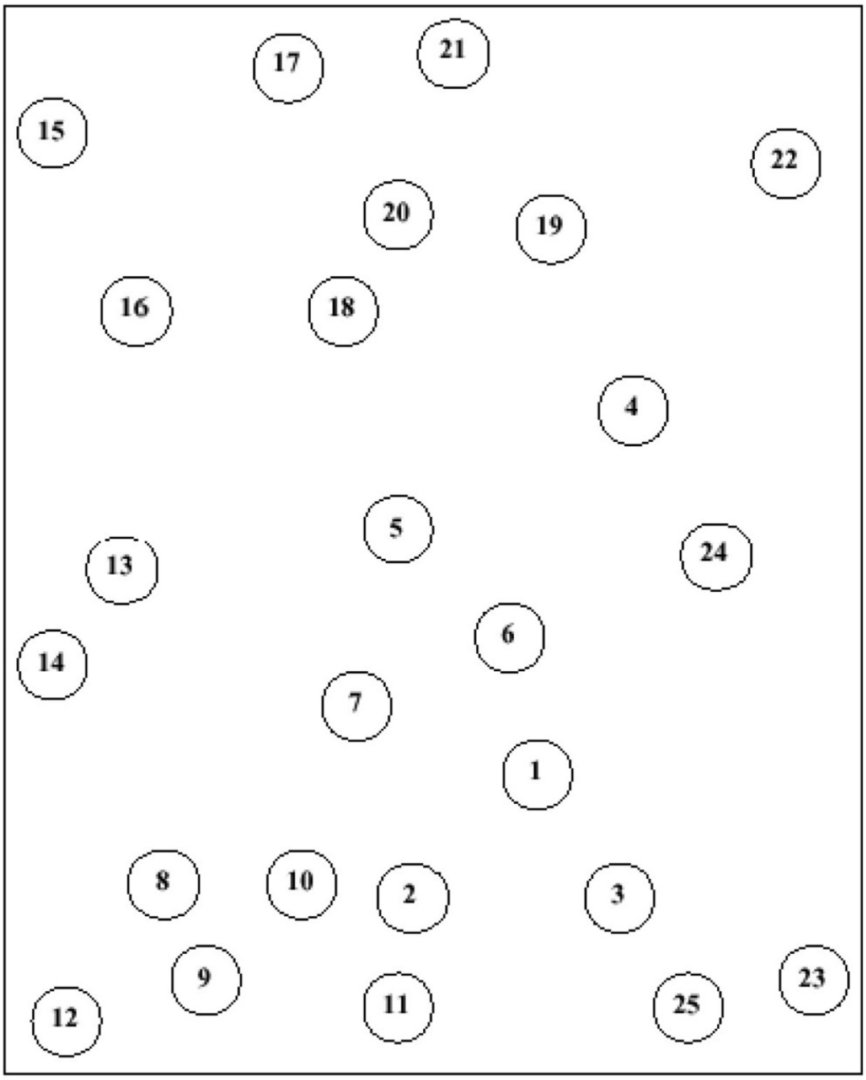
……………………………………………………………………………

Trail Making (Part A) – *SAMPLE*

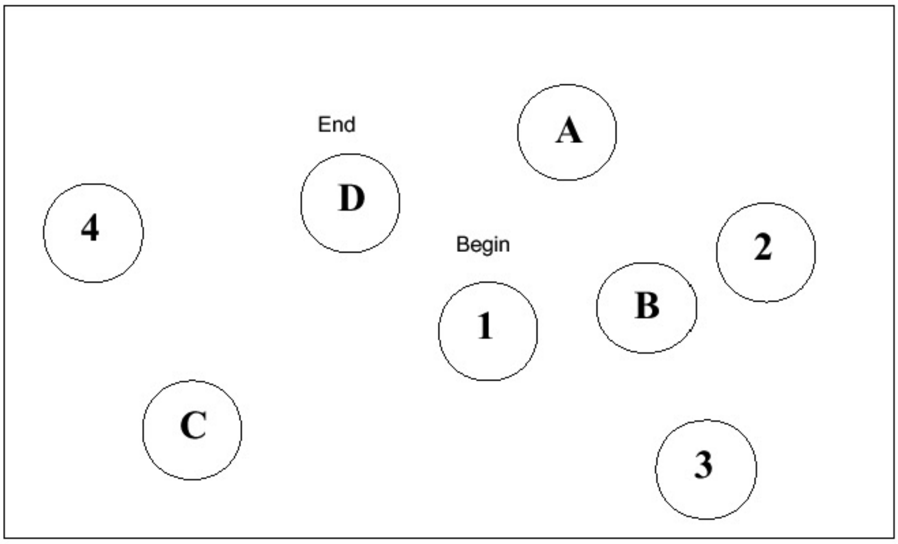


Trail Making (Part A)

Student's Name: ______________________ Date: ______________

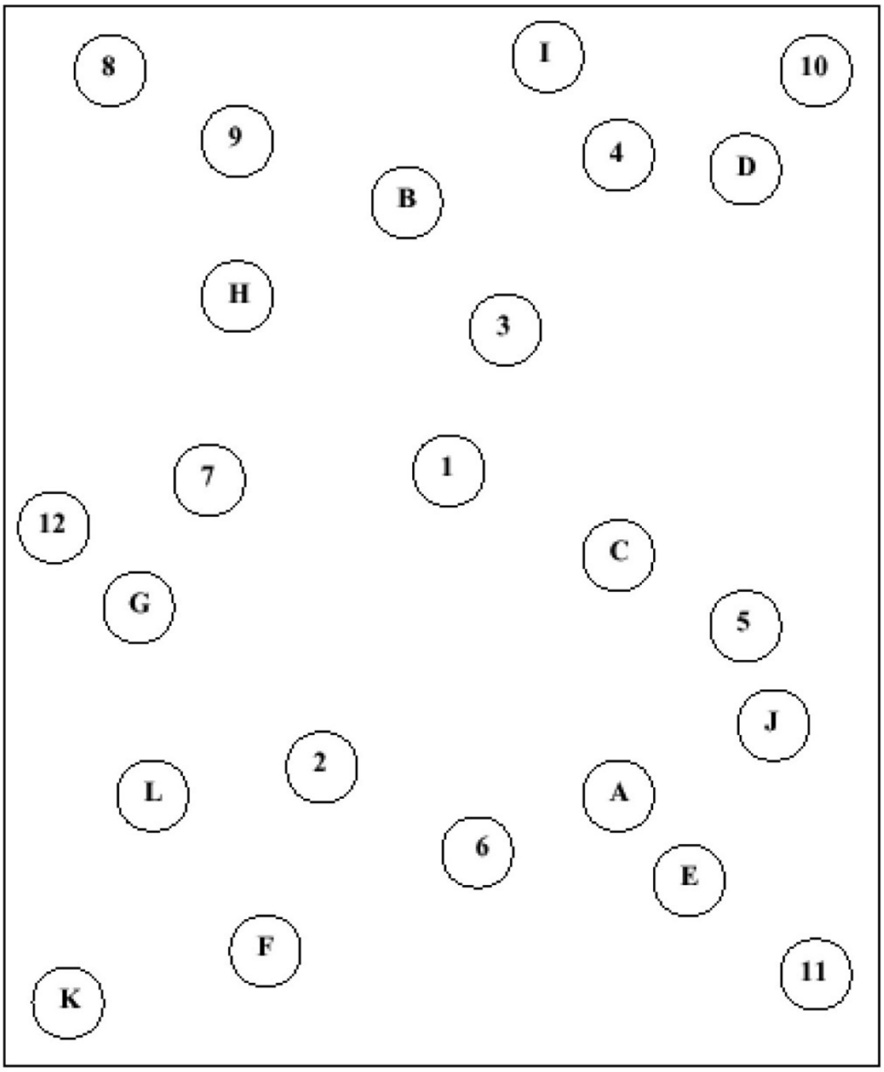


Trail Making (Part B) – *SAMPLE*



Trail Making (Part B)

Student's Name: ______________________________ Date: ____________________



Appendix 7: Kick-Smart Homework logbook

Syllabus Content Covered

Weeks 1, 2 and 3:

MA2-6NA: Uses mental and informal written strategies for multiplication and division

MA2-2WM: Selects and uses appropriate mental or written strategies, or technology, to solve problems

Content:

- use mental strategies to recall multiplication facts for multiples of two, three, five and ten

Weeks 4 and 5:

MA2-6NA: Uses mental and informal written strategies for multiplication and division

MA2-2WM: Selects and uses appropriate mental or written strategies, or technology, to solve problems

Content:

- Count by twos, threes, fives or tens using skip counting
- Count by fours, sixes, sevens, eights and nines using skip counting

Week 6:

All previous outcomes and content included

Week 1 Checklist
Numeracy focus: Multiplication (Times Tables)

Date completed	Session 1 ____/____/____	Session 2 ____/____/____	Session 3 ____/____/____

Who participated with me? ☑	Parent	Sibling	Other	Comments:
Session 1				
Session 2				
Session 3				

How much did you enjoy your homework today? ☑	Not at all	A little	A lot	Comments:
Session 1				
Session 2				
Session 3				

Activities completed:

Maths (tables) ☑	1x	2x	3x	4x	5x	6x	7x	8x	9x	10x

Fitness ☑	Hovers	Skipping	Push-ups	Jumping Knees	Shuttles

Ball Skill ☑	Catching	Throwing	Kicking

Footwork (Ladders) ☑	Jumping	In-Out	Single feet	Lateral feet	Side-step

Things I need to keep working on:

Maths (tables) ☑	1x	2x	3x	4x	5x	6x	7x	8x	9x	10x

Fitness ☑	Hovers	Skipping	Push-ups	Jumping Knees	Shuttles

Ball Skill ☑	Catching	Throwing	Kicking

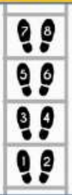
Footwork (Ladders) ☑	Jumping	In-Out	Single feet	Lateral feet	Side-step

Comments / feedback:

Week 1 Session 1	
KICK-SMART Homework 	
Math Focus	Multiplication (times tables)
Instructions	Step 1. Perform the Kick-Smart exercise while reciting the set multiplication table for 30 seconds Step 2. Perform the FMS activity for 30 seconds Step 3. Complete all 5 stations
Challenge	Swap the 2 x multiplication tables for the 12 x multiplication tables
Equipment	1 - 2 x skipping ropes, 1 x tennis ball, 1 x soccer ball
Who?	Perform activities with a parent, friend or on your own (doing FMS activities against a wall)

	A) Times Tables + KICK-SMART Activity 30 secs	B) FMS Activity 30 secs
2 x	Double foot rope skip  	Underarm throw 
4 x	Squat Kicks 	Underarm throw 
6 x	Hover and punch (alternate arms) 	Kick 
8 x	Push-ups  OR 	Kick 
10 x	5 m shuttle run 	Kick 

Week 1 Session 2	
KICK-SMART Homework 	
Math Focus	Multiplication (times tables)
Instructions	Step 1. Perform the footwork / ladder run drills while reciting the set multiplication tables up to 10 times the number Step 2. Perform the FMS activity for 30 seconds
Challenge	Also complete 11 and 12 times the number for each times table set
Equipment	1 sports ladder
Who?	Perform activities with a parent, friend or on your own (doing FMS against a wall)

A) Times Tables + Ladder runs			B) FMS Activity 30 secs	
1x or 2x	Jumping			Underarm throw 
3x or 4x	Lateral feet			Underarm throw 
5x or 6x	In-out			Underarm throw 
7x or 8x	Single feet			Underarm throw 
9x or 10x	Side-step			Underarm throw 

Week 1 Session 3

KICK-SMART Homework

Math Focus	Multiplication (times tables)
Instructions	Step 1. Perform the Kick-Smart exercise while reciting the set multiplication table for 30 seconds Step 2. Perform the FMS activity for 30 seconds Step 3. Complete all 5 stations
Challenge	Swap the 1 x multiplication tables for the 11 x multiplication tables
Equipment	1 - 2 x skipping ropes, 1 x tennis ball, 1 x soccer ball
Who?	Perform activities with a parent, friend or on your own (doing FMS activities against a wall)

A) Times Tables + Kick-Smart Activity 30 secs			B) FMS Activity 30 secs
1 x	Hover and punch (alternate arms) 		Underarm throw 
3 x	Push-ups  OR 		Underarm throw 
5 x	5 metre shuttle run 		Underarm throw 
7 x	Double foot rope skip  		Kick 
9 x	Squat Kicks  		Kick 

Week 2 Checklist
Numeracy focus: Multiplication (Times Tables)

Date completed	Session 1 _____/_____/_____	Session 2 _____/_____/_____	Session 3 _____/_____/_____

Who participated with me? ☑	Parent	Sibling	Other	Comments:
Session 1				
Session 2				
Session 3				

How much did you enjoy your homework today? ☑	Not at all	A little	A lot	Comments:
Session 1				
Session 2				
Session 3				

Activities completed:

Maths (tables) ☑	1x	2x	3x	4x	5x	6x	7x	8x	9x	10x
Fitness ☑	Hovers	Skipping	Push-ups	Jumping Knees	Shuttles					
Ball Skill ☑	Catching	Throwing	Kicking							
Footwork (Ladders) ☑	Jumping	In-Out	Single feet	Lateral feet	Side-step					

Things I need to keep working on:

Maths (tables) ☑	1x	2x	3x	4x	5x	6x	7x	8x	9x	10x
Fitness ☑	Hovers	Skipping	Push-ups	Jumping Knees	Shuttles					
Ball Skill ☑	Catching	Throwing	Kicking							
Footwork (Ladders) ☑	Jumping	In-Out	Single feet	Lateral feet	Side-step					

Comments / feedback:

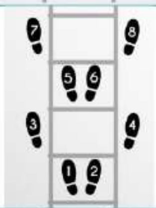
Week 2 Session 1

KICK-SMART Homework

Math Focus	Multiplication (times tables)
Instructions	Step 1. Perform the Kick-Smart exercise while reciting the set multiplication table for 30 seconds Step 2. Perform the FMS activity for 30 seconds Step 3. Complete all 5 stations
Challenge	Swap the 2 x multiplication tables for the 12 x multiplication tables
Equipment	1 - 2 x skipping ropes, 1 x tennis ball, 1 x soccer ball
Who?	Perform activities with a parent, friend or on your own (doing FMS activities against a wall)

A) Kick-Smart Activity 30 secs		B) Times Tables + FMS Activity 30 secs
Squat Kick 	2 x	Underarm throw 
Bear walks 	4 x	Underarm throw 
5 metre shuttle run 	6 x	Kick 
Jumping Knees / One foot hops 	8 x	Kick 
5 metre side gallop shuttle 	10 x	Kick 

Week 2 Session 2	
KICK-SMART Homework	
Math Focus	Multiplication (times tables)
Instructions	Step 1. Perform the footwork / ladder run drills while reciting the set multiplication tables up to 10 times the number Step 2. Perform the FMS activity for 30 seconds
Challenge	Also complete 11 and 12 times the number for each times table set
Equipment	1 sports ladder
Who?	Perform activities with a parent, friend or on your own (doing FMS against a wall)

A) Times Tables + Ladder runs				B) FMS Activity 30 secs
1x or 2x	Jumping			Underarm throw 
3x or 4x	Lateral feet			Underarm throw 
5x or 6x	In-out			Underarm throw 
7x or 8x	Single feet			Underarm throw 
9x or 10x	Side-step			Underarm throw 

Week 2 Session 3

KICK-SMART Homework

Math Focus	Multiplication (times tables)
Instructions	Step 1. Perform the Kick-Smart exercise while reciting the set multiplication table for 30 seconds Step 2. Perform the FMS activity for 30 seconds Step 3. Complete all 5 stations
Challenge	Swap the 1 x multiplication tables for the 11 x multiplication tables
Equipment	1 - 2 x skipping ropes, 1 x tennis ball, 1 x soccer ball
Who?	Perform activities with a parent, friend or on your own (doing FMS activities against a wall)

A) Kick-Smart Activity 30 secs	B) Times Tables + FMS Activity 30 secs	
5 metre shuttle run 	1 x	Underarm throw 
Jumping Knees / One foot hops 	3 x	Underarm throw 
5 metre side gallop shuttle 	5 x	Underarm throw 
Squat Kicks 	7 x	Kick 
Bear walks 	9 x	Kick 

Week 3 Checklist
Numeracy focus: Multiplication (Times Tables)

Date completed	Session 1 ____/____/____	Session 2 ____/____/____	Session 3 ____/____/____

Who participated with me? ☑	Parent	Sibling	Other	Comments:
Session 1				
Session 2				
Session 3				

How much did you enjoy your homework today? ☑	Not at all	A little	A lot	Comments:
Session 1				
Session 2				
Session 3				

Activities completed:

Maths (tables) ☑	1x	2x	3x	4x	5x	6x	7x	8x	9x	10x

Fitness ☑	Hovers	Skipping	Push-ups	Squat Kicks	Shuttles

Ball Skill ☑	Catching	Throwing	Kicking

Footwork (Ladders) ☑	Jumping	In-Out	Single feet	Lateral feet	Side-step

Things I need to keep working on:

Maths (tables) ☑	1x	2x	3x	4x	5x	6x	7x	8x	9x	10x

Fitness ☑	Hovers	Skipping	Push-ups	Squat Kicks	Shuttles

Ball Skill ☑	Catching	Throwing	Kicking

Footwork (Ladders) ☑	Jumping	In-Out	Single feet	Lateral feet	Side-step

Comments / feedback:

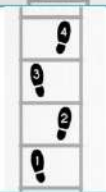
Week 3 Session 1

KICK-SMART Homework

Math Focus	Multiplication (times tables)
Instructions	Step 1. Perform the Kick-Smart exercise for 30 seconds Step 2. Perform the FMS activity while reciting your choice of multiplication table for 30 seconds (Choose a different one each time!) Step 3. Complete all 10 stations
Challenge	See if you can do any times tables higher than 10!
Equipment	1 - 2 x skipping ropes, 1 x tennis ball, 1 x soccer ball
Who?	Perform activities with a parent, friend or on your own (doing FMS activities against a wall)

	A) Times Tables + Kick-Smart Activity 30 secs	B) FMS Activity 30 secs
Choose a times table!	Double foot rope skip 	Underarm throw 
Choose a times table!	Push-ups  OR	Underarm throw 
Choose a times table!	Squat Kicks 	Kick 
Choose a times table!	5 metre shuttle run 	Kick 
Choose a times table!	Hover and punch (alternate arms) 	Kick 

Week 3 Session 2	
Kick-Smart Homework 	
Math Focus	Multiplication (times tables)
Instructions	Step 1. Perform the ladder exercise for 30 seconds Step 2. Perform the FMS activity while reciting your choice of multiplication table for 30 seconds (Choose a different one each time!) Step 3. Complete all 10 stations
Challenge	See if you can do any times tables higher than 10!
Equipment	1 - 2 x skipping ropes, 1 x tennis ball, 1 x soccer ball
Who?	Perform activities with a parent, friend or on your own (doing FMS against a wall)

A) Times Tables + Ladder runs			B) FMS Activity 30 secs	
Choose a times table!	Jumping			Underarm throw 
Choose a times table!	Lateral feet			Underarm throw 
Choose a times table!	In-out			Underarm throw 
Choose a times table!	Single feet			Underarm throw 
Choose a times table!	Side-step			Underarm throw 

Week 3 Session 3

Kick-Smart Homework

Math Focus	Multiplication (times tables)
Instructions	Step 1. Perform the Kick-Smart exercise for 30 seconds Step 2. Perform the FMS activity while reciting your choice of multiplication table for 30 seconds (Choose a different one each time!) Step 3. Complete all 10 stations
Challenge	See if you can do any times tables higher than 10!
Equipment	1 - 2 x skipping ropes, 1 x tennis ball, 1 x soccer ball
Who?	Perform activities with a parent, friend or on your own (doing FMS activities against a wall)

A) Times Tables + Kick-Smart Activity 30 secs		B) FMS Activity 30 secs
Choose a times table!	Jumping Knees / One foot hops 	Underarm throw 
Choose a times table!	Bear walks 	Underarm throw 
Choose a times table!	Squat Kicks 	Kick 
Choose a times table!	5 metre shuttle run 	Kick 
Choose a times table!	5 metre side gallop shuttle 	Kick 

Week 4 Checklist
Numeracy focus: Skip counting (forward)

Date completed	Session 1	Session 2	Session 3
	_______/_______/_______ /_______	_______/______/______	______/______

Who participated with me? ☑	Parent	Sibling	Other	Comments:
Session 1				
Session 2				
Session 3				

How much did you enjoy your homework today? ☑	Not at all	A little	A lot	Comments:
Session 1				
Session 2				
Session 3				

Activities completed:

Maths (tables)	☑	1x	2x	3x	4x	5x	6x	7x	8x	9x	10x
Fitness	☑	Hovers	Skipping	Push-ups	Squat Kicks	Shuttles					
Ball Skill	☑	Catching	Throwing	Kicking							
Footwork (Ladders)	☑	Jumping	In-Out	Single feet	Lateral feet	Side-step					

Things I need to keep working on:

Maths (tables)	☑	1x	2x	3x	4x	5x	6x	7x	8x	9x	10x
Fitness	☑	Hovers	Skipping	Push-ups	Squat Kicks	Shuttles					
Ball Skill	☑	Catching	Throwing	Kicking							
Footwork (Ladders)	☑	Jumping	In-Out	Single feet	Lateral feet	Side-step					

Comments / feedback:

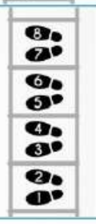
Week 4 Session 1	
HIIT Homework 	
Math Focus	Skip counting (forward)
Instructions	Step 1. Perform the HIIT exercise for 30 seconds Step 2. Perform the FMS activity while reciting your choice of multiplication table for 30 seconds (Choose a different one each time!) Step 3. Complete all 10 stations
Challenge	See if you can do any times tables higher than 10!
Equipment	1 - 2 x skipping ropes, 1 x tennis ball, 1 x soccer ball
Who?	Perform activities with a parent, friend or on your own (doing FMS activities against a wall)

A) Skip Count + Strength Activity Count up by ……..	B) Movement Activity 10 metres and back
1s to 10 doing Lunges or Lunge Jumps  or 	**Sprint** 
3s to 30 doing Hover & punch (alternate arms) 	**High Skip** 
5s to 50 doing Push-ups  OR 	**Jumping Knees (left foot)** 
7s to 70 doing Squat, Jab-Cross 	**Jumping Knees (right foot)** 
9s to 90 doing Sit-ups  or 	**Leap** 

Week 4 Session 2

Kick-Smart Homework

Math Focus	Skip counting (forward)
Instructions	Step 1. Perform the ladder exercises for 30 seconds, counting as high as you can by the specified number before time runs out! Step 2. Perform the FMS activities while reciting your choice of multiplication table for 30 seconds.
Challenge	See if you can do any times tables higher than 10!
Equipment	1 - 2 x skipping ropes, 1 x tennis ball, 1 x soccer ball
Who?	Perform activities with a parent, friend or on your own (doing FMS against a wall)

A) Skip counting + ladder runs			B) FMS Activity 30 secs	
By 4s to as high as you can!	Jumping			Underarm throw 
By 6s to as high as you can!	Lateral feet			Kick 
By 7s to as high as you can!	In-out			Kick 
By 9s to as high as you can!	Single feet			Underarm throw 
By 10s to as high as you can!	Side-step			Underarm throw 

Week 4 Session 3	
Kick-Smart Homework	
Math Focus	Skip counting (forward)
Instructions	Step 1. Perform the Kick-Smart exercise for 30 seconds Step 2. Perform the FMS activity while reciting your choice of multiplication table for 30 seconds (Choose a different one each time!) Step 3. Complete all 10 stations
Challenge	See if you can do any times tables higher than 10!
Equipment	1 - 2 x skipping ropes, 1 x tennis ball, 1 x soccer ball
Who?	Perform activities with a parent, friend or on your own (doing FMS activities against a wall)

A) Skip Count + Strength Activity Count up by	B) Movement Activity 10 metres and back
2s to 20 doing Lunges or Lunge Jumps  or 	**Sprint** 
4s to 40 doing Hover and punch (alternate arms) 	**High Skip** 
6s to 60 doing Push-ups  OR 	**Jumping Knees (left foot)** 
8s to 80 doing Squat, Jab-Cross 	**Jumping Knees (right foot)** 
10s to 100 doing Sit-ups  or 	 **Leap** 

Week 5 Checklist
Numeracy focus: Skip counting (backwards)

Date completed	Session 1 ____/____/____	Session 2 ____/____/____	Session 3 ____/____/____

Who participated with me? ☑	Parent	Sibling	Other	Comments:
Session 1				
Session 2				
Session 3				

How much did you enjoy your homework today? ☑	Not at all	A little	A lot	Comments:
Session 1				
Session 2				
Session 3				

Activities completed:

Maths (skip counting) ☑	1s	2s	3s	4s	5s	6s	7s	8s	9s	10s

Fitness ☑	Sprints	Crab walk	High skip	Bear walk	Squat, Jab-Cross

Ball Skill ☑	Catching	Throwing	Kicking

Footwork (Ladders) ☑	Jumping	In-Out	Single feet	Lateral feet	Side-step

Things I need to keep working on:

Maths (skip counting) ☑	1s	2s	3s	4s	5s	6s	7s	8s	9s	10s

Fitness ☑	Sprints	Crab walk	High Skip	Bear walk	Squat, Jab-Cross

Ball Skill ☑	Catching	Throwing	Kicking

Footwork (Ladders) ☑	Jumping	In-Out	Single feet	Lateral feet	Side-step

Comments / feedback:

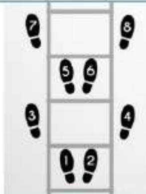
Week 5 Session 1	
Kick-Smart Homework	
Math Focus	Skip counting (backwards)
Instructions	Step 1. Perform the FMS activities while counting backwards for 30 seconds. Step 2. Perform the Kick-Smart exercises for 30 seconds, counting backwards from the specified number
Challenge	See if you can backwards from a higher number! Try counting backwards by 4s from 80!
Equipment	1x sports ladder, 1 x tennis ball, 1 x soccer ball
Who?	Perform activities with a parent, friend or on your own (doing FMS against a wall)

A) Skip Count + Strength Activity Count backwards from ……..	B) Movement Activity 10 metres and back
10 by 1s while throwing underarm 	**Sprint** 
90 by 9s while throwing underarm 	**Crab Walk** 
20 by 2s while kicking 	**Sprint** 
40 by 4s while kicking 	**Jumping Knee / High Skip** 
60 by 6s while kicking 	**Bear Walk** 

Week 5 Session 2

Kick-Smart Homework

Math Focus	Skip counting (backwards)
Instructions	Step 1. Perform the ladder exercises for 30 seconds, counting backwards from the specified number Step 2. Perform the FMS activities while counting backwards for 30 seconds.
Challenge	See if you can backwards from a higher number! Try counting backwards by 4s from 80!
Equipment	1 sports ladder, 1x soccer ball, 1x tennis ball
Who?	Perform activities with a parent, friend or on your own (doing FMS against a wall)

A) Skip counting (backwards) + ladder runs				**B) FMS Activity 30 secs**
Backwards by 4s from 40!	Jumping			Underarm throw 
Backwards by 6s from 60!	Lateral feet			Kick 
Backwards by 3s from 30!	In-out			Kick 
Backwards by 8s from 80!	Single feet			Underarm throw 
Backwards by 9s from 90!	Side-step			Underarm throw 

Week 5 Session 3	
Kick-Smart Homework	
Math Focus	Skip counting (backwards)
Instructions	Step 1. Perform the FMS activities while counting backwards for 30 seconds. Step 2. Perform the Kick-Smart activity whilst counting backwards for 30 seconds.
Challenge	See if you can backwards from a higher number! Try counting backwards by 4s from 80!
Equipment	1x sports ladder, 1 x tennis ball, 1 x soccer ball
Who?	Perform activities with a parent, friend or on your own (doing FMS against a wall)

A) Skip Count + Strength Activity Count backwards from	B) Kick-Smart Activity 10 metres and back
30 by 3s while throwing underarm 	**Jumping Knee / High Skip** 
50 by 5s while throwing underarm 	**Bear Walk** 
70 by 7s while throwing underarm 	Squat Kicks 
80 by 8s while kicking 	Squat Kicks 
100 by 10s while kicking 	**Crab Walk** 

Week 6 Checklist
Numeracy focus: Revision of weeks 1-5

Date completed	Session 1	Session 2	Session 3
	____/____/____ /	____/____/____	____/____

Who participated with me? ☑	Parent	Sibling	Other	Comments:
Session 1				
Session 2				
Session 3				

How much did you enjoy your homework today? ☑	Not at all	A little	A lot	Comments:
Session 1				
Session 2				
Session 3				

Activities completed:

Maths (tables)	☑	1x	2x	3x	4x	5x	6x	7x	8x	9x	10x
Fitness	☑	Hovers	Skipping	Push-ups	Squat Kicks	Shuttles					
Ball Skill	☑	Catching	Throwing	Kicking							
Ladders	☑	Jumping	In-Out	Single feet	Lateral feet	Side-step					

Things I need to keep working on:

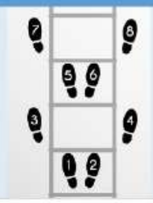
Maths (tables)	☑	1x	2x	3x	4x	5x	6x	7x	8x	9x	10x
Fitness	☑	Hovers	Skipping	Push-ups	Squat Kicks	Shuttles					
Ball Skill	☑	Catching	Throwing	Kicking							
Ladders	☑	Jumping	In-Out	Single feet	Lateral feet	Side-step					

Comments / feedback:

Week 6 Session 1

KICK-SMART Homework

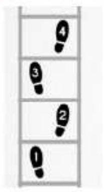
Math Focus	Revision
Instructions	Step 1. Perform the ladder exercise for 30 seconds Step 2. Perform the FMS activity while reciting your choice of multiplication table or skip count for 30 seconds (Choose a different one each time!)
Challenge	See how many times you can recite the multiplication table in 30 seconds
Equipment	1x sports ladder, 1x tennis ball, 1x soccer ball
Who?	Perform activities with a parent, friend or other partner

A) Revision			B) Movement activity 60 seconds
Your choice multiplication In out		→	Underarm throw 
6s to 60 doing Push-ups  or 		→	Underarm throw 
Your choice multiplication Lateral feet		→	Kick 
8s to 80 doing Squat Kicks (on the spot) 		→	Kick 
Your choice multiplication Side step		→	Kick 

Week 6 Session 2

KICK-SMART Homework

Math Focus	Revision
Instructions	Step 1. Perform the ladder exercises for as many days as answers the maths question Step 2. Perform the FMS activities whilst counting the days that answers the maths question.
Challenge	Have your partner make up some bonus questions for you!
Equipment	1x tennis ball, 1x ladder
Who?	Perform activities with a parent, friend or on your own (doing FMS against a wall)

A) Times tables and skip count (Counting backwards from)			B) FMS Activity 30 secs	
90 by 9s while throwing underarm				Squat Kicks 
10 by 1s while throwing underarm				Hover and punch (alternate arms) 
Backwards by 4s from 40!	Jumping			5m shuttle run 
6,7,8 or 9x	Single feet			Bear walks (30 seconds) 
Choose a times table	Push ups 			Jumping Knees (alternating feet) 

Week 6 Session 3

KICK-SMART Homework

Math Focus	Revision
Instructions	Step 1. Perform the HIIT exercise while reciting the set multiplication table for 30 seconds Step 2. Perform the FMS activity for 30 seconds
Challenge	See if you can do any times tables higher than 10!
Equipment	1x tennis ball, 1x soccer ball
Who?	Perform activities with a parent, friend or on your own

	A) Times Tables + HIIT Activity 30 secs	B) FMS Activity 30 secs
Choose a times table!	Sit ups with 2x cross punches  or 	Under arm throw 
Choose a times table!	Lunges of lunge jumps  or 	Under arm throw 
Choose a times table!	Squat Kicks  	Kick 
Choose a times table!	Bear walks 	Kick 
Choose a times table!	5 metre side gallop shuttle 	Kick 

Appendix 8: Kick-Smart Homework Project Participant Information Statement and Consent Forms

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Parent/Student Information Sheet

Document Version [3]; dated [12/11/2020]

Research Project: Kick-Smart Homework

Dear Student and Parent or Caregiver,

You are invited to participate in the research project identified above which is being conducted by *Mr Louis Burt (Doctoral Researcher)* under the supervision of *Dr Narelle Eather, Dr Nicholas Riley, Dr Myrto Mavilidi* and *Ass. Prof. Robert Parkes* from the University of Newcastle. As a PhD candidate, Mr Burt will be supervised and supported by Dr Eather, Dr Parkes, and Dr Riley throughout the project.

Why is the research being done?

Physical fitness and physical activity are associated with improved test scores in children. Unfortunately opportunities for children's physical activity have decreased. Innovative ways to get children active are needed.
The purpose of the research is to determine the feasibility of a school-based program called Kick-Smart Homework. This is an initiative focusing on Martial arts training and mathematics. The program integrates mathematics and physical activity into homework activities conducted at home, and assessments conducted at school. Based on previous studies, increased participation in Physical Activity (PA) may improve cognitive functioning and academic achievement. Movement can actually aid learning and the integration of physical activity has the potential to enhance learning and student engagement in other curriculum areas.

Who can participate in the research?

Students in Stage 2-3. If you agree to participate, students will participate in the University of Newcastle Kick-Smart Homework program. Students in the classes will be randomly assigned to a control or intervention group. The intervention group involves (3 x 10 minutes per week) Mathematics sessions conducted by students at their homes. Examples of activities include count by twos, threes, fives or tens using skip counting, count by fours, sixes, sevens, eights and nines using skip counting, multiplication and division with shuttle run or push-ups. A logbook will be given to each child to be completed each week, explicitly showing the cognitive and physical assessments. The researchers of UoN will demonstrate the activities at the beginning of the program. Children in the control group will follow their normal routine at home. Parents in the intervention group can support their children by helping them complete the logbooks.
The program will combine a curriculum-based program with the integration of physical activity and mathematics, with activities occurring at home. The program is a randomised trial and will run for 6 weeks in week 2 of term 1, 2021.
The total time required by participants in this study will be 4 hours.

Only the students who provide signed consent letters will contribute to the study data.

What choice do you have?

Participation in this research is entirely your choice and only schools where both the principals and teachers have agreed to participate will be included in this study. If you do agree to your child's participation, you and your child may withdraw from the study at any time without giving a reason. A decision not to participate or discontinuation of involvement in the study will not jeopardise your relationship with your school. Similarly, students will be included in the study only after a consent form has been signed by you. If you initially agree to participate, you can choose to withdraw from the study at any time without giving a reason.

What would you and your child be asked to do?

The Kick-Smart Homework program is a home-based intervention and has the potential based on the results of previous trials to motivate and engage students both academically and physically. Students will be asked to participate in 3 x 10 minute sessions of mathematics/martial arts (per week) over a six week period in Term 1, 2021 that promotes moderate to vigorous activity.

Students assigned to the intervention group will be asked to perform a set of cognitive and physical activities at their homes (based on the logbook).

All students will be asked to participate in a number of assessments. Qualified staff from the University of Newcastle will be involved in the administration of all questionnaires/interviews, fitness and cognitive tests. Questionnaires and physical fitness tests will be performed in class groups of participating students, during school time and at a time negotiated with the regular classroom teacher to minimise any interruption to student learning. The baseline and post-test assessments will use the same measures.

Physical fitness: participant will be required to: (1) run back and forth between two lines, 20m apart, within a set time limit, (2) stand with both feet parallel and behind a marked starting line asked to swing their arms backwards and then forwards and to jump with both feet simultaneously as far forward as possible, (3) start in push-up position (or modified push up) with their hands shoulder width apart and directly below their shoulders, in time to a metronome set at 40 beats per minute, participants will push-up on one beat and down on the next (20 push-ups per minute). The participant will continue until they can do no more in rhythm.

Fundamental movement skills: After watching a demonstration of each skill, participant will individually be filmed performing two attempts of the kick, catch, and underhand throw.

Cognitive test: will be measured using the trail making test (TMT). Participants will complete a visual task as quickly and correct as possible.

Student self-efficacy and engagement in mathematics: will be measured using a modified (stage appropriate) version of the Programme for International Assessment (PISA) scales. This will be read to the students by a researcher at both baseline and post-intervention.

Basic mathematics facts assessment: Children's academic performance in Mathematics will be measured using the One Minute Basic Fact test. Each Student will be 4 sets of 33 questions. Each set of questions is focuses on either multiplication, division, subtraction or addition. Students will be given exactly one minute to complete each set, with a short break in between each set of questions.

Process evaluation: students will complete a brief questionnaire (stage appropriate) post program.

Who will be responsible for delivering and administering this research?
The researchers will be primarily responsible for the program. Qualified staff from the University of Newcastle will be involved in the delivery of all assessments. The research team will work in close collaboration with the classroom teacher. Questionnaires, physical fitness and cognitive tests will be performed in class groups of participating students, during school time and at a time negotiated with the regular classroom teacher to minimise any interruption to student learning.

What are the risks and benefits of participating?
There are no perceived risks to participation. The evaluation measures will be carried out by the research team and trained research assistants who all hold the appropriate child protection certification and first aid qualifications. Based on previous studies, students will have no greater chance of injury by participating in these measures in comparison to their normal PE and school sport activities. Any incident within testing will be treated using the appropriate first-aid response.
The observations will be conducted by trained research assistants and the activity sessions will be developed by the research team and delivered alongside the classroom teacher.

How will the information collected be used?

The data collected from this study will form part of an Honour's thesis submission. Also, they will be used for journal publications and conference presentations and to inform future practice for the design of valuable, evidence-based physical activity/mathematics programs.

How will privacy be protected?
Any personal information provided by students and parents will be confidential to the researchers. The results of the study will be published in general terms and will not allow the identification of individual students. Once the data has

been collected, de-identified using participant codes and entered into an electronic data file, questionnaires and other data collection sheets will be destroyed. The electronic data will be retained for at least five years but no individual will be identifiable in the data files or published reports.

What do you need to do to participate?
All students wanting to participate in this study will be required to return a Consent Form (prior to the study starting), which has been signed by the student and their parent/guardian. Parents/guardians, please discuss the information in this information statement with your child. If you and your child are willing to participate in this study, please complete the accompanying Consent Form and return it to the collection point at your school office. Please note, the final decision to participate should be made by your child.

Further information
Following the completion of the study, the school will be sent a dissemination report describing the findings of the study. It is suggested that the findings are disseminated to students and their parents/guardians via a school newsletter or similar method. If you would like further information please do not hesitate to contact Dr Nick Riley.
Thank you for considering this invitation.

Nick Riley

Dr Nicholas Riley

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Dr Myrto Mavilidi

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Phone: (02) 4921 6242
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Louis Burt

PhD Candidate
Faculty of Education & Arts
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Louis.burt@uon.edu.au

This project has been approved by the University's Ethics committee, Approval number [H-2017-0322]. 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 Services, NIER Precinct, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 4921 6333, email Human-Ethics@newcastle.edu.au.

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Parent/Student Consent Form

Document Version [3]; dated [12/11/2020]

Research Project: Kick-Smart Homework

Chief Investigators: Dr Myrto Mavilidi, Dr Nick Riley, Dr Narelle Eather, Assoc. Prof. Robert Parkes, Mr Louis Burt

I have discussed the research project with my child and have had an opportunity to ask the research team questions about the research. I understand that my child's participation in this research is voluntary and my child is free to withdraw from the research project at any time. My refusal to consent to my child participating or withdrawal of consent will not affect my relationship with the University of Newcastle or the school. My withdrawal will not result in any disciplinary action against me, nor will it affect my child's academic grades, given that this is a purely voluntary research task.

If they are asked,

students will complete the mathematics/martial arts activities at their homes ☐

students will be filmed during fundamental movement skills assessments ☐

All students will also complete a range of assessments conducted before and after the program at school. These include:

- ☐ Physical fitness tests ☐
- Fundamental movement skills ☐
- A cognitive test ☐
- A basic mathematics facts assessment ☐
- Evaluation of student's attitudes towards Maths ☐
- A brief process evaluation questionnaire (stage appropriate) post program. ☐

By signing below I am indicating my consent for my child to participate in this research project as it has been described to me in the Information Statement, a copy of which I have retained.

Name of school: ______________________

Parent / Guardian's name: ________________ **Parent / Guardian's signature:** ________________

Student's name: ______________________ **Student's signature:** ______________________

PLEASE RETURN THE COMPLETED SHEET TO YOUR SCHOOL OFFICE WITHIN ONE WEEK OF RECEIVING THIS INVITATION.

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Principal Information Sheet

Document Version [3]; dated [12/11/2020]

Research Project: Kick-Smart Homework

Dear Principal,

You are invited to participate in the research project identified above which is being conducted by *Mr Louis Burt (Phd candidate)* under the supervision of *Dr Narelle Eather, Dr Nicholas Riley, Ass. Prof. Robert Parkes, and Dr Myrto Mavilidi* from the University of Newcastle.

Why is the research being done?

The purpose of the research is to determine the feasibility of a home-based program called Kick-Smart Homework. This is an initiative focusing on martial arts training and mathematics. The program integrates mathematics and physical activity conducted at home, and assessments conducted at school. Based on previous studies, increased participation in Physical Activity (PA) may improve cognitive functioning and academic achievement. Movement can actually aid learning and the integration of physical activity has the potential to enhance learning and student engagement in other curriculum areas.

Who can participate in the research?

Students in Stage 2-3. If you agree to participate, students will participate in the University of Newcastle Kick-Smart Homework program. Students in the classes will be randomly assigned to a control or intervention group. The intervention group involves (3 x 10 minutes per week) Mathematics sessions conducted by students at their homes. Examples of activities include count by twos, threes, fives or tens using skip counting, count by fours, sixes, sevens, eights and nines using skip counting, multiplication and division with shuttle run or push-ups. A logbook will be given to each child to be completed each week, explicitly showing the cognitive and physical assessments. The researchers of UoN will demonstrate the activities at the beginning of the program. Children in the control group will follow their normal routine at home. Parents in the intervention group can support their children by helping them complete the logbooks.
The program will combine a curriculum-based program with the integration of physical activity and mathematics, with activities occurring at home. The program is a randomised trial and will run for 6 weeks in week 2 of term 1, 2021.
The total time required by participants in this study will be 4 hours.

What choice do you have?

Participation in this research is entirely your choice and only schools where both the principals and teachers have agreed to participate will be included in this study. If you do agree to your school's participation, you may withdraw from the study at any time without giving a reason. A decision not to participate or discontinuation of involvement in the study will not jeopardise your relationship with the University of Newcastle. Similarly, students in your school will be included in the study only after a consent form has been signed by the students and their parents/guardians. If they initially agree to participate, they can choose to withdraw from the study at any time without giving a reason.

What would you be asked to do?

The Kick-Smart Homework program is a home-based intervention and has the potential based on the results of previous trials to motivate and engage students both academically and physically. Students will be asked to participate in 3 x 10 minute sessions of mathematics/martial arts (per week) over a six week period in Term 1 2021 that promotes moderate to vigorous activity.
Principals will be required to provide consent to the school to participate and distribute the Information Statement and Consent Form to relevant teachers/students and parents.

Teachers

The teachers will be asked to weekly collect the students' activity logbook. Teaching staff involved in the program will also be asked to participate in a short interview at the completion of the program.

Students

Students will be asked to participate in a number of assessments including: Physical fitness tests (20m repeated shuttle run test, Standing jump test, Push-up test (or modified push up test), fundamental movement skills (kick, catch, underhand throw), cognitive test (Trail Making test), a basic mathematics facts assessment using the One Minute Basic Number Facts Assessment Tool, and student's attitudes towards Maths will be measured using a modified (stage appropriate) version of the Programme for International Assessment (PISA) scales. Baseline and post test data will be collected from all participants.
Students assigned to the intervention group will be asked to perform a set of cognitive and physical activities at their homes (based on the logbook).

Measures

Qualified staff from the University of Newcastle will be involved in the administration of all questionnaires/interviews, fitness and cognitive tests. Questionnaires and physical fitness tests will be performed in class groups of participating students, during school time and at a time negotiated with the regular classroom teacher to minimise any interruption to student learning. The baseline and post-test assessments will use the same measures.

Physical fitness: participant will be required to: (1) run back and forth between two lines, 20m apart, within a set time limit, (2) stand with both feet parallel and behind a marked starting line asked to swing their arms backwards and then forwards and to jump with both feet simultaneously as far forward as possible, (3) start in push-up position (or modified push up) with their hands shoulder width apart and directly below their shoulders, in time to a metronome set at 40 beats per minute, participants will push-up on one beat and down on the next (20 push-ups per minute). The participant will continue until they can do no more in rhythm.

Fundamental movement skills: After watching a demonstration of each skill, participant will individually be filmed performing two attempts of the kick, catch, and underhand throw.

Cognitive test: will be measured using the trail making test (TMT). Participants will complete a visual task as quickly and correct as possible.

Student self-efficacy and engagement in mathematics: will be measured using a modified (stage appropriate) version of the Programme for International Assessment (PISA) scales. This will be read to the students by a researcher at both baseline and post-intervention.

Basic mathematics facts assessment: Children's academic performance in Mathematics will be measured using the One Minute Basic Fact test. Each Student will be 4 sets of 33 questions. Each set of questions is focuses on either multiplication, division, subtraction or addition. Students will be given exactly one minute to complete each set, with a short break in between each set of questions.

Process evaluation: students will complete a brief questionnaire (stage appropriate) post program.

How will the information collected be used?

The data collected from this study will form part of an Honour's thesis submission. They will also be used for journal publications and conference presentations and to inform future practice for the design of valuable, evidence-based physical activity programs.

How will privacy be protected?
Any personal information provided by students and parents will be confidential to the researchers. The results of the study will be published in general terms and will not allow the identification of individual students. Once the data has been collected, de-identified using participant codes and entered into an electronic data file, questionnaires and other data collection sheets will be destroyed. The electronic data and will be retained for at least five years but no individual will be identifiable in the data files or published reports.

What do you need to do to participate?
If you are willing for your school to participate in this study, could you please complete the accompanying Consent Form and return it to the researchers in the reply paid envelope provided.

Upon receipt of your consent, Dr Nicholas Riley will contact you to organise a time to visit the school and provide yourself, teachers, students with information about the study. If you would like to organise a different route for the dissemination of the Information Sheet and Consent Form to students, please let us know. Students will be required to return a Consent Form before participating in the study.

Further information
Following the completion of the study, the school will be sent a dissemination report describing the findings of the study. It is suggested that the findings are disseminated to students and their parents/guardians via a school newsletter or similar method. If you would like further information please do not hesitate to contact Dr Nicholas Riley.

Thank you for considering this invitation.

Nick Riley

Dr Nicholas Riley

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Narelle Eather

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Louis Burt

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This project has been approved by the University's Ethics committee, Approval number [H-2017-0322]. 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 Services, NIER Precinct, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 4921 6333, email Human-Ethics@newcastle.edu.au.

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Principal Consent Form

Document Version [3]; dated [12/11/2020]

Research Project: Kick-Smart Homework

Chief Investigators: Dr Myrto Mavilidi, Dr Nick Riley, Dr Narelle Eather, Assoc. Prof. Robert Parkes, Mr Louis Burt

I have been given information about the project identified above. I understand that if I consent to my school's involvement in this project, all students in Stage 2-3 will be able to participate in the program (upon students'/parents' consent). If they are asked, students will complete the mathematics/martial arts activities at their homes. Students will also complete a range of assessments conducted before and after the program at school. These include: Physical fitness tests, fundamental movement skills, a cognitive test, a basic mathematics facts assessment, evaluation of student's attitudes towards Maths, and a brief process evaluation questionnaire (stage appropriate) post program.

I have had an opportunity to ask the research team questions about the research. I understand that my school's participation in this research is voluntary and that my school, teachers and students are free to withdraw from the research project at any time. My refusal to participate or withdrawal of consent will not affect my relationship with the University of Newcastle.

By signing below I am indicating my consent for my school to participate in this research project as it has been described to me in the Information Statement, a copy of which I have retained.

Name of school: ____________________________

Principal's name: ____________________________

Signature: ________________________________ **Date:** ______________

PLEASE EMAIL OR FAX COMPLETED SHEET TO: Myrto.Mavilidi@newcastle.edu.au or FAX. No. (0)2 49216242 BEFORE 16/12/2020.

Myrto Mavilidi
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Teacher Information Sheet

Document Version [4]; dated [12/11/2020]

Research Project: Kick-Smart Homework

Dear Teacher,

Physical fitness and physical activity are associated with improved test scores in children. Unfortunately opportunities for children's physical activity have decreased. Innovative ways to get children active are needed.

You are invited to participate in the research project identified above which is being conducted by *Mr Louis Burt (Doctoral Researcher)* under the supervision of *Dr Narelle Eather, Dr Nicholas Riley, Dr Myrto Mavilidi* and *Ass. Prof. Robert Parkes* from the University of Newcastle. As a PhD candidate, Mr Burt will be supervised and supported by Dr Eather, Dr Parkes, and Dr Riley throughout the project.

Why is the research being done?

The purpose of the research is to determine the feasibility of a school-based program called Kick-Smart Homework. This is an initiative focusing on martial arts training and mathematics. The program integrates mathematics and physical activity into homework activities conducted at home, and assessments conducted at school. Based on previous studies, increased participation in Physical Activity (PA) may improve cognitive functioning and academic achievement. Movement can actually aid learning and the integration of physical activity has the potential to enhance learning and student engagement in other curriculum areas.

Who can participate in the research?

Students in Stage 2. If you agree to participate, students will participate in the University of Newcastle Kick-Smart Homework program. Students in the classes will be randomly assigned to a control or intervention group. The intervention group involves (3 x 10 minutes per week) Mathematics sessions conducted by students at their homes. Examples of activities include count by twos, threes, fives or tens using skip counting, count by fours, sixes, sevens, eights and nines using skip counting, multiplication and division with shuttle run or push-ups. A logbook will be given to each child to be completed each week, explicitly showing the cognitive and physical assessments. The researchers of UoN will demonstrate the activities at the beginning of the program. Children in the control group will follow their normal routine at home. Parents in the intervention group can support their children by helping them complete the logbooks. The program will combine a curriculum-based program with the integration of physical activity and mathematics, with activities occurring at home. The program is a randomised trial and will run for 6 weeks in week 2 of term 1, 2021.
The total time required by participants in this study will be 4 hours.

Only the students who provide signed consent letters will contribute to the study data.

What choice do you have?

Participation in this research is entirely your choice and only schools where both the principals and teachers have agreed to participate will be included in this study. If you do agree to your class' participation, you may withdraw from the study at any time without giving a reason. A decision not to participate or discontinuation of involvement in the study will not jeopardise your relationship with the University of Newcastle. Similarly, students in your class will be included in the study only after a consent form has been signed by the students and their parents/guardians. If they initially agree to participate, they can choose to withdraw from the study at any time without giving a reason.

What would you be asked to do?

The Kick-Smart Homework program is a home-based intervention and has the potential based on the results of previous trials to motivate and engage students both academically and physically. Students will be asked to participate in 3 x 10 minute sessions of mathematics/martial arts (per week) over a six week period in Term 1, 2021 that promotes moderate to vigorous activity.

Teachers

The teachers will be asked to weekly collect the students' activity logbook. Teaching staff involved in the program will also be asked to participate in a short interview at the completion of the program, lasting approximately 15 min. The interview will be conducted during work hours upon teachers' availability.

Students

Students will be asked to participate in a number of assessments including: Physical fitness tests (20m repeated shuttle run test, Standing jump test, Push-up test (or modified push up test), fundamental movement skills (kick, catch, underhand throw), cognitive test (Trail Making test), a basic mathematics facts assessment using the One Minute Basic Number Facts Assessment Tool, and student's attitudes towards Maths will be measured using a modified (stage appropriate) version of the Programme for International Assessment (PISA) scales. Students assigned to the intervention group will be asked to perform a set of cognitive and physical activities at their homes (based on the logbook).

Baseline and post test data will be collected from all participants.

Measures

Qualified staff from the University of Newcastle will be involved in the administration of all questionnaires/interviews, fitness and cognitive tests. Questionnaires and physical fitness tests will be performed in class groups of participating students, during school time and at a time negotiated with the regular classroom teacher to minimise any interruption to student learning. The baseline and post-test assessments will use the same measures.

Physical fitness: participant will be required to: (1) run back and forth between two lines, 20m apart, within a set time limit, (2) stand with both feet parallel and behind a marked starting line asked to swing their arms backwards and then forwards and to jump with both feet simultaneously as far forward as possible, (3) start in push-up position (or modified push up) with their hands shoulder width apart and directly below their shoulders, in time to a metronome set at 40 beats per minute, participants will push-up on one beat and down on the next (20 push-ups per minute). The participant will continue until they can do no more in rhythm.

Fundamental movement skills: After watching a demonstration of each skill, participant will individually be filmed performing two attempts of the kick, catch, and underhand throw.

Cognitive test: will be measured using the trail making test (TMT). Participants will complete a visual task as quickly and correct as possible.

Student self-efficacy and engagement in mathematics: will be measured using a modified (stage appropriate) version of the Programme for International Assessment (PISA) scales. This will be read to the students by a researcher at both baseline and post-intervention.

Basic mathematics facts assessment: Children's academic performance in Mathematics will be measured using the One Minute Basic Fact test. Each Student will be 4 sets of 33 questions. Each set of questions is focuses on either multiplication, division, subtraction or addition. Students will be given exactly one minute to complete each set, with a short break in between each set of questions.

Process evaluation: students will complete a brief questionnaire (stage appropriate) post program.

How will the information collected be used?

The data collected from this study will form part of an Honour's thesis submission. Also, they will be used for journal publications and conference presentations and to inform future practice for the design of valuable, evidence-based physical activity programs.

How will privacy be protected?

Any personal information provided by students and parents will be confidential to the researchers. The results of the study will be published in general terms and will not allow the identification of individual students. Once the data has been collected, de-identified using participant codes and entered into an electronic data file, questionnaires and other data collection sheets will be destroyed. The electronic data and will be retained for at least five years but no individual will be identifiable in the data files or published reports.

What do you need to do to participate?
If you are willing to participate in this study, could you please complete the accompanying Consent Form and return it to the researchers in the reply paid envelope provided.

Upon receipt of your consent, Dr Nicholas Riley will contact you to organise a time to visit the school and provide yourself, and students with information about the study. If you would like to organise a different route for the dissemination of the Information Sheet and Consent Form to students, please let us know. Students will be required to return a Consent Form before participating in the study.

Further information
Following the completion of the study, the school will be sent a dissemination report describing the findings of the study. It is suggested that the findings are disseminated to students and their parents/guardians via a school newsletter or similar method. If you would like further information please do not hesitate to contact Dr Nicholas Riley.
Thank you for considering this invitation.

Nick Riley

Dr Nicholas Riley

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Louis Burt

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Teacher Consent Form

Document Version [4]; dated [12/11/2020]

Research Project: Kick-Smart Homework

Chief Investigators: Dr Myrto Mavilidi, Dr Nick Riley, Dr Narelle Eather, Assoc. Prof. Robert Parkes, Mr Louis Burt

I have been given information about the project identified above. I understand that if I consent to my class' involvement in this project, all students in Stage 2 will be able to participate in the program (upon students'/parents' consent). If they are asked, students will complete the mathematics/martial arts activities at their homes. Students will also complete a range of assessments conducted before and after the program at school. These include: Physical fitness tests, fundamental movement skills, a cognitive test, a basic mathematics facts assessment, evaluation of student's attitudes towards Maths, and a brief process evaluation questionnaire (stage appropriate) post program. Also, I am consenting to be interviewed, and I will be responsible for the collection of weekly logbooks.

I have had an opportunity to ask the research team questions about the research. I understand that my class' participation in this research is voluntary and that myself and my students are free to withdraw from the research project at any time. My refusal to participate or withdrawal of consent will not affect my relationship with the University of Newcastle.

By signing below, I am indicating my consent for my class to participate in this research project as it has been described to me in the Information Statement, a copy of which I have retained.

Name of school: ______________________________

Principal's name: ______________________________

Signature: ______________________________ **Date:** ______________

PLEASE EMAIL OR FAX COMPLETED SHEET TO: Myrto.Mavilidi@newcastle.edu.au or FAX. No. (0)2 4921642 BEFORE 16/12/2020

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Kick-Smart Homework

Student questionnaire
Stage 2

Your name: (First)____________________ **(Last)**____________________

Year level Please tick (✓)

☐ Grade 3 ☐ Grade 4 ☐ Grade 5 ☐ Grade 6

Leave blank.

Student questionnaire *Subject ID:…………*

Age: _______

Month you were born: ____________ **Year you were born**: _________

Gender: *please tick (✓)*

☐ Male ☐ Female

What is your cultural background?

☐ Australian ☐ Asian ☐ European ☐ Middle Eastern ☐ African

☐ Other: (please specify) ___________

What language do you speak most at home? *Please tick (✓)*

☐ **English**

☐ **Another language - (please specify):** ______________________

Are you of **Aboriginal** or **Torres Strait Islander** descent? *Please tick (✓)*

Yes ☐ No ☐

What is the name of the suburb you live in most of the time? ______________________

What is the postcode? ______________________

(a) Student Questionnaire - self-efficacy and engagement in mathematics

* 1. What is your full name? (First name and last name)

* 2. Which school do you attend?

3. How confident do you feel about having to do the following Mathematics tasks?

	Very confident	Confident	Not very confident	Not at all confident
Adding two numbers in the hundreds.	○	○	○	○
Subtracting two numbers in the hundreds.	○	○	○	○
Multiplying any number by 2.	○	○	○	○
Multiplying any number by 7.	○	○	○	○
Understanding graphs presented in newspapers.	○	○	○	○
Changing measuring units from centimetres to metres	○	○	○	○
Identifying shapes by the number of sides they have (for example a triangle or a hexagon)	○	○	○	○
Calculating the decimal value of a simple fraction like 3/4	○	○	○	○

4. Thinking about studying Mathematics: to what extent do you agree with the following statements?

	Strongly agree	Agree	Disagree	Strongly disagree
I am just not good at Mathematics.	○	○	○	○
I get good marks in Mathematics.	○	○	○	○
I learn Mathematics quickly.	○	○	○	○
I have always believed that Mathematics is one of my best subjects.	○	○	○	○
In my Mathematics class, I understand even the most difficult work.	○	○	○	○

5. Thinking about your views on Mathematics: to what extent do you agree with the following statements?

	Strongly agree	Agree	Disagree	Strongly disagree
I enjoy reading about Mathematics.	○	○	○	○
I look forward to my Mathematics lessons.	○	○	○	○
I do Mathematics because I enjoy it.	○	○	○	○
I am interested in the things I learn in Mathematics.	○	○	○	○

6. Thinking about studying Mathematics: to what extent do you agree with the following statements?

	Strongly agree	Agree	Disagree	Strongly disagree
I often worry that it will be difficult for me in Mathematics classes.	○	○	○	○
I get very stressed when I have to do Mathematics homework.	○	○	○	○
I get very nervous doing Mathematics problems.	○	○	○	○
I feel helpless when doing a Mathematics problem.	○	○	○	○
I worry that I will get poor marks in Mathematics.	○	○	○	○

(b) Student Evaluation of the Kick-Smart Homework

Thank you for taking part in the Kick-Smart Homework program. We would like to know what you thought of the program and would be grateful if you could complete the following questionnaire. Your response will help us improve the program for the future.

Please say how much you agree with the following statements and questions by CIRCLING the most appropriate response below. Please be honest in your reply. All responses will be treated in confidence. You do not have to put your name.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1)	I was excited when I first heard about Kick-Smart Homework.	SD	D	N	A	SA
2) Timing						
a)	The program length (6 weeks) was good.	SD	D	N	A	SA
b)	The number of sessions (3/week) was right.	SD	D	N	A	SA
3) Instructors (University staff) – Demonstrations of Activities						
5)	The instructors had a high level of knowledge.	SD	D	N	A	SA
a)	The instructor made the activities fun.	SD	D	N	A	SA
b)	The instructor was enthusiastic.	SD	D	N	A	SA
c)	The instructor made the activities easy to understand.	SD	D	N	A	SA
4) The Program						
a)	The program was enjoyable.	SD	D	N	A	SA
b)	I looked forward to the sessions.	SD	D	N	A	SA
c)	I liked working outside of the classroom	SD	D	N	A	SA
d)	I liked being physically active in the sessions.	SD	D	N	A	SA
6) Program Impact						
a)	After participating in Kick-Smart Homework I have more positive feelings about physical activity.	SD	D	N	A	SA
b)	After participating in Kick-Smart Homework I feel better about myself.	SD	D	N	A	SA
c)	After participating in Kick-Smart Homework I find it easier to concentrate in class.	SD	D	N	A	SA

d)	After participating in Kick-Smart Homework I am more active.	SD	D	N	A	SA
e)	I enjoyed participating in the Kick-Smart Homework program.	SD	D	N	A	SA
f)	I now feel more confident in doing my maths work.	SD	D	N	A	SA
g)	The program has encouraged me to be more physically active.	SD	D	N	A	SA
h)	My involvement in the program has increased my knowledge of the importance of regular physical activity.	SD	D	N	A	SA

6) **Which parts of the Kick-Smart Homework program were most enjoyable? (Describe) List the activities that were your favourite?**

7) **Were there any parts of Kick-Smart Homework that you did not enjoy? (Please explain)**

8) **Do you have any additional comments about the Kick-Smart Homework that you think might be useful for the researchers?**

THANK YOU FOR TAKING THE TIME TO COMPLETE THIS QUESTIONNAIRE.
YOUR FEEDBACK IS GREATLY APPRECIATED.

Appendix C – Teacher interview Schedule

Teacher Interview: Kick-Smart Homework

1. Can you tell me about your experiences with the Kick-Smart Homework program?
2. Do you think your students enjoyed the activities/why/ why not? Have you noticed any changes with your students?
3. What do you think were the benefits of Kick-Smart Homework for you and your students?
4. How well do you think the students understood the math content in Kick-Smart Homework sessions? Can you give me a specific example?
5. Do you think the PA aspect of the lesson contributed to a greater level of student engagement throughout the school day?
6. Have you noticed any changes on students' attitudes towards homework?

Suggestions for Improvement

7. Is there anything that could be changed to improve Kick-Smart Homework?
8. Are you likely to continue with this approach after the study?
9. Would you recommend this to other schools/teachers?
10. Do you have anything else to say about Kick-Smart Homework?
11. Anything else you would like to add?

Appendix D: Assessment protocols

1- 20m repeated shuttle run test (maximal effort test)
2- Standing jump test,
3- Push-up test (or modified push up test)
4- Fundamental Movement Skills
5- Trail Making Test
6- The One Minute Basic Number Fact Test

20m repeated shuttle run test (maximal effort test)

- The 20m Shuttle Run Test provides percentile scores for students aged 11-14 years. It is an international test adopted by the Australian Institute of Sport. The Australian Fitness Education Award provides standards to be achieved for students aged 9-18 years [1].

Student Objective

To run back and forth between two lines, 20m apart, within a set time limit. Running speed is increased by 0.5km/hr each minute using the 20m Shuttle Run Test cadence CD.

Notes

- The test requires maximal effort.
- The shuttles increase progressively - students are required to run until they can no longer keep up with the speed set by the tape.
- Students should not be discouraged if they finish earlier than others.
- Do not push students to exhaustion.

Interpretation of Results

- A score of 4.1 indicates a student has run one shuttle at Level 4. Record the level and the number of shuttles into that level.
- Scores should be compared with the appropriate sex and age related standards (see below).
- Students scoring at or above the set standard are considered to have the level of cardiorespiratory endurance needed to gain health benefits. These students should be encouraged to maintain or increase their cardiorespiratory endurance.
- Students scoring below the standard need to increase their cardiorespiratory endurance towards the criterion based standard.
- A low score may be determined by numerous factors. These include: aerobic capacity, growth, inability to pace, running/walking efficiency, unknown injury, motivation and environmental conditions.

Criterion-based Standards - (level & shuttle) - PAZ 1

Age	9	10	11	12	13	14	15	16	17	18
M	3.4	3.6	5.1	5.4	5.9	6.6	7.8	8.5	8.5	8.5
F	2.7	3.4	3.5	" 4.1	4.3	5.1	5.3	5.5	5.5	5.5

Criterion-based Standards - (level & shuttle) - PAZ 2

Age	9	10	11	12	13	14	15	16	17	18
M	4.1	4.6	6.0	6.4	6.6	7.5	8.8	9.3	9.6	9.6
F	3.4	3.9	4.4	4.8	5.3	5.7	6.0	6.3	6.6	6.6

Criterion-based Standards - (level & shuttle) - PAZ 3

Age	9	10	11	12	13	14	15	16	17	18
M	4.8	5.6	6.9	7.4	8.1	8.4	9.8	10.1	10.7	10.7
F	4.1	4.4	5.3	5.5	6.1	6.3	6.7	7.1	7.7	7.7

Standing broad jump test (muscular fitness lower limb [3,4]

Purpose:
To evaluate explosive strength of the lower limb body muscles

Student Objectives:
To jump as far as possible using a double foot jump from a standing / static start.

Equipment:

* Measuring tape

* Chalk / tape to mark starting line

Procedure

1) The athlete stands behind a line marked on the ground with feet slightly apart. A two foot take-off and landing is used, with swinging of the arms and bending of the knees to provide forward drive. The subject attempts to jump as far as possible, landing on both feet without falling backwards. The start of the jump must be from a static position.

2) The result will be recorded in metres.

3) A non-slip hard surface, chalk and a tape measure are used to perform the test.

4) 2 attempts will be performed with the longest jump being recorded. The measurement is taken from take-off line to the nearest point of contact on the landing (back of the heels).

90° Push-Up [2]

- The 90° push-up to an elbow angle of 90° is the recommended test for upper body strength and endurance. Test administration requires little or no equipment; multiple students may be tested at one time, and few zero scores result. This test also teaches students an activity that can be used throughout life as a conditioning activity as well as in self-testing. The 90° push-up has generally been shown to produce consistent scores but reliability depends on how it is administered.

PHOTO 7.7 Starting position for

Test Objective

- To complete as many 90° push-ups as possible at a rhythmic pace.

Equipment and Facilities

- The only equipment necessary is an audiotape with the recorded cadence or a metranome. The correct cadence is 20 90° push-ups per minute (1 90° push-up every 3 seconds).

Test Instructions

- The student being tested assumes a prone position on the mat with hands placed under or slightly wider than the shoulders, fingers stretched out, legs straight and slightly apart, and toes tucked under. The student pushes up off the mat with the arms until arms are straight, keeping the legs and back straight. The back should be kept in a straight line from head to toes throughout the test (photo 7.7). The student then lowers the body using the arms until the elbows bend at a 90° angle and the upper arms are parallel to the floor (photo 7.8). This move- ment is repeated as many times as possible. The student should push up and continue the movement until the arms are straight on each repetition. The rhythm should be approximately 20 90° push-ups per minute or 1 90° push-up every 3 seconds.

When to Stop

- Students are stopped when the second form correction (mistake) is made. Only one form correction is allowed.

Form Corrections

- Stopping to rest or not maintaining a rhythmic pace
- Not achieving a 90° angle with the elbow on each repetition
- Not maintaining correct body position with a straight back
- Not extending arms fully

SCORING

- The score is the number of 90° push-ups performed. For ease in administration, it is permissible to count the first incorrect 90° push-up. It is important to be consistent with all of the students and classes when determining if you will count the first incorrect push-up.

1. ACHPER, *Australian Fitness Education Award: Teacher's Handbook and Curriculum Ideas*. 2nd ed2004, South Australia: The Australian Council of Health Physical Education and Recreation. 61.
2. Welk, G.J. and M.D. Merideth, *FITNESSGRAM / ACTIVITYGRAM: Reference Guide*. 3rd, Edition ed2008, Dallas, TX: The Cooper Institute. 206.

3. Ortega, F.B., et al., *Reliability of health-related physical fitness tests in European adolescents. The HELENA study.* International Journal of Obesity, 2008(1-9).
4. Mackenzie, B., *101 Performance evaluation tests*, ed. B. Mackenzie2005, London: Jonathan Pye.

Trail Making test

From the MOCA: Montreal Cognitive Assessment

The Tests:

" The trail making tests A and B from the MOCA requires immediate recognition of the symbolic significance of number and letters, ability to scan the page continuously to identify the next number or letter in sequence, flexibility in integrating the numerical and alphabetical series, and completion of the these requirements under the pressure of time " (Reitan, 1992).

General Instructions

Trail Making Part A:

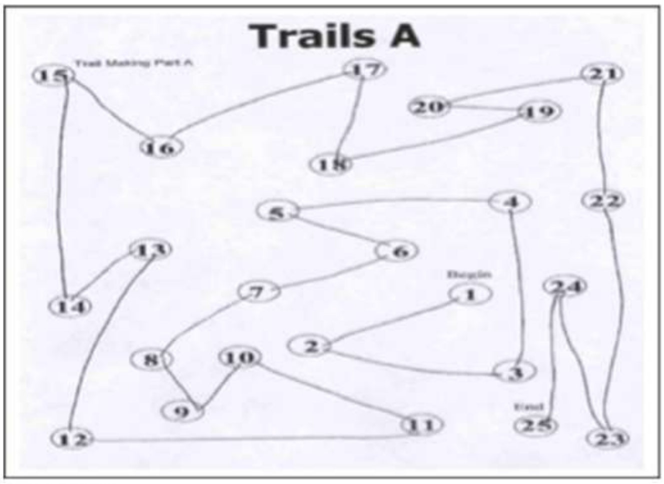
1. Provide the person with the sample trails A first. Once completed correctly then move on to the actual Trails A. □

2. Instruct the individual to, "Please draw a line connecting the numbers 1, 2, 3, 4 etc. in order until you reach the end. Try to draw the lines as fast as you can." □

3. If the person makes a mistake on the sample Trails A point it out to them and explain the error. i.e. "you skipped a circle; you started with the wrong number, etc." Repeat the sample Trails A with correction instructions until they have completed it correctly or it becomes evident that they are unable to do the task. □

4. Once the sample trails A has been completed correctly give them the real Trails A. Repeat the instructions as given in step one. □

5. Start timing the test as soon as the instruction is given to begin the test. □



Example

Trail Making Part B:

1. Provide the individual with the sample Trails B. Once they have completed it correctly then move on to the actual Trails B. □

2. Instruct the individual that this second part of the test is slightly more difficult as it requires them to alternate between numbers and letters. Say "On this page are some numbers and letters. Begin at 1 and draw a line from 1 to A, A to 2, 2 to B, and so forth until you reach the end. Remember first you have a number, then a letter, then a number, and so on. Draw the lines as fast as you can." □

3. If the person makes a mistake on the sample Trails B, point out the error and explain why it is incorrect. Repeat this procedure until the task is performed correctly or it becomes apparent they cannot complete the task. □

4. After the person has completed the sample Trails B provide them with the actual Trails B. Repeat the instruction given in point 2. Timing begins as soon as

the person is told to begin. □

5. Be altert for mistakes. If the person makes a mistake point it out to them immediately, return the person to the last correct circle and continue the test from that point. Continue timing and record the number of errors made until task is completed □

Scoring Trails A and B

1. Part A and B are scored separately. The score for each part is the number of seconds required to complete the task. □

2. More than 1 error or scoring below the 10th percentile in the time (in seconds) taken raises concerns (50th percentile is given for comparison). □

3. Generally time over 3 minutes or > 1 error is a failure. □

Norms for Trails A and B by age (in seconds) and education		
Age Percentiles	Trails A* Trails B□(education – no ≤Grade 12 >Grade 12* change)	
65- 50 69 10	37 seconds 86 53 137	68 77
70- 50 74 10	38 101 61 172	84 112
75- 50 79 10	46 120 70 189	81 178
80- 50 84 10	52 140 93 158	128 223

Fundamental Movement Skills

Test of Gross Motor Development–Third Edition

TGMD-3

Examiner Record Form–Norming

Dale A. Ulrich

Section 1. Identifying Information

Child's Name or ID #: ____________________

Examiner's Name: ____________ Affiliation: ____________ Examiner's Email Address: ____________

Date of Testing: ____________ Date of Birth: ____________

Gender: Male ☐ Female ☐ Age in Years: ____________ Child's Weight Status: Underweight ☐ Normal ☐ Overweight ☐

Child's Residential Location: City ☐ Suburb of City ☐ Rural or Small Town ☐ Preferred Hand: Right ☐ Left ☐ Not Established ☐ Preferred Foot: Right ☐ Left ☐ Not Established ☐

Section 2. Scoring Notes

- Directions for **all** test items require you to first give the child a good demonstration of the skill, which includes all of the performance criteria; give the child a practice trial, followed by two test trials that you score.
- Score each performance criterion as:
  - 1 = performs correctly
  - 0 = does not perform correctly
- **Performance criteria scores** are calculated by summing the score on trial 1 and trial 2 for each performance criterion.
- **Skill scores** are calculated by summing all of the performance criteria scores for each skill.
- The total **locomotor subtest score** is calculated by summing all 6 locomotor skill scores.
- The total **ball skills subtest score** is calculated by summing the 7 ball skill scores.
- The total **gross motor test score** is calculated by summing the total locomotor subtest score and the total ball skills subtest score.
- We have learned that test administrator bias occurs when the tester is unsure how to score a performance criterion. When testing a child, if you are unsure of whether the child performed a performance criterion correctly, administer another trial and just look at that performance criterion and score it.
- When testing children with a disability or very young children who appear to be distracted easily, it is recommended that you to have them stand on a small poly spot or other marker and tell them to stand on the marker and watch your demonstration. It is also helpful to use another poly spot or marker as the child's starting position for the locomotor skills. Giving these children more structure during your testing should be helpful.

Section 3. Subtest Performance Record

Locomotor Subtest

Skill	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
1. Run	60 feet (18.3 meters) of clear space to run, and two cones or markers	Place two cones 50 feet (15.2 meters) apart. Make sure there is at least 8–10 feet (2.4–3.1 meters) of space beyond the cone for a safe stopping distance. Tell the child to run fast from one cone to the other cone when you say, "Go." Repeat a second trial.	1. Arms move in opposition to legs with elbows bent			
			2. Brief period where both feet are off the surface			
			3. Narrow foot placement landing on heel or toes (not flat-footed)			
			4. Non-support leg bent about 90 degrees so foot is close to buttocks			
				Skill Score		
2. Gallop	25 feet (7.6 meters) of clear space, and two cones or markers	Place two cones 25 feet apart. Tell the child to gallop from one cone to the other cone and stop. Repeat a second trial.	1. Arms flexed and swinging forward			
			2. A step forward with lead foot followed with the trailing foot landing beside or a little behind the lead foot (not in front of the lead foot)			
			3. Brief period where both feet come off the surface			
			4. Maintains a rhythmic pattern for four consecutive gallops			
				Skill Score		
3. Hop	A minimum of 15 feet (4.6 meters) of clear space, and two cones or markers	Place two cones 15 feet apart. Tell the child to hop four times on his/her preferred foot (established before testing). Repeat a second trial.	1. Non-hopping leg swings forward in pendular fashion to produce force			
			2. Foot of non-hopping leg remains behind hopping leg (does not cross in front of)			
			3. Arms flex and swing forward to produce force			
			4. Hops four consecutive times on the preferred foot before stopping			
				Skill Score		
4. Skip	A minimum of 30 feet (9.1 meters) of clear space, and two cones or markers	Place two cones 30 feet apart. Mark off two lines at least 30 feet apart with cones/markers. Tell the child to skip from one cone to the other cone. Repeat a second trial.	1. A step forward followed by a hop on the same foot			
			2. Arms are flexed and move in opposition to legs to produce force			
			3. Completes four continuous rhythmical alternating skips			
				Skill Score		
5. Horizontal jump	A minimum of 10 feet (3.1 meters) of clear space, and tape or markers	Mark off a starting line on the floor, mat, or carpet. Position the child behind the line. Tell the child to jump far. Repeat a second trial.	1. Prior to take off both knees are flexed and arms are extended behind the back			
			2. Arms extend forcefully forward and upward reaching above the head			
			3. Both feet come off the floor together and land together			
			4. Both arms are forced downward during landing			
				Skill Score		

Ball Skills Subtest *(continued)*

Skill	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
4. Two-hand catch	A 4-inch (10.2-centimenter) plastic ball, 15 feet (4.6 meters) of clear space, and tape or a marker	Mark off two lines 15 feet apart. The child stands on one line and the tosser stands on the other line. Toss the ball underhand to the child aiming at the child's chest area. Tell the child to catch the ball with two hands. Only count a trial in which toss is near child's chest. Repeat a second trial.	1. Child's hands are positioned in front of the body with the elbows flexed			
			2. Arms extend reaching for the ball as it arrives			
			3. Ball is caught by hands only			
				Skill Score		
5. Kick a stationary ball	An 8–10 inch (20.3–25.4 centimeters) plastic, playground, or soccer ball; tape or a marker; a wall; and clear space for kicking	Mark off one line about 20 feet (6.1 meters) from the wall and a second line 8 feet (2.4 meters) beyond the first line. Place the ball on the first line closest to the wall. Tell the child to run up and kick the ball hard toward the wall. Repeat a second trial.	1. Rapid, continuous approach to the ball			
			2. Child takes an elongated stride or leap just prior to ball contact			
			3. Non-kicking foot placed close to the ball			
			4. Kicks ball with instep or inside of preferred foot (not the toes)			
				Skill Score		
6. Overhand throw	A tennis ball, a wall, and 20 feet (6.1 meters) of clear space	Attach a piece of tape on the floor 20 feet from the wall. Have the child stand behind the tape line facing the wall. Tell the child to throw the ball hard at the wall. Repeat a second trial.	1. Windup is initiated with a downward movement of hand and arm			
			2. Rotates hip and shoulder to a point where the non-throwing side faces the wall			
			3. Steps with the foot opposite the throwing hand toward the wall			
			4. Throwing hand follows through after the ball release, across the body toward the hip of the non-throwing side			
				Skill Score		
7. Underhand throw	A tennis ball, tape, a wall, and 15 feet (4.6 meters) of space	Attach a piece of tape 15 feet from the wall. Have the child stand behind the tape line facing the wall. Tell the child to throw the ball underhand and hit the wall. Repeat a second trial.	1. Preferred hand swings down and back reaching behind the trunk			
			2. Steps forward with the foot opposite the throwing hand			
			3. Ball is tossed forward hitting the wall without a bounce			
			4. Hand follows through after ball release to at least chest level			
				Skill Score		

Ball Skills Subtest Total Score ______

Total Gross Motor Score ______

Appendix

The One Minute Basic Number Facts Tests (1995)

The *One Minute Basic Number Facts Tests* are based on the performance of students in South Australian government schools in 1995. All scores in the norm tables have been rounded to the nearest 0.5 or nearest whole number.

In the norm tables the `normal range' column indicates the range of scores within which roughly 50% of the students in that particular age group would score. This range has been determined by using $\pm.68$ standard deviation.

The `critically low score' has been calculated from one standard deviation below the mean for the age group. Scores below this critical level place a student in approximately the bottom 16% of students in that age group.

The test-retest reliability of the One Minute Basic Number Facts Tests ranges from .88 to .94 according to age level.

Instruction for administration

- Ensure that the test material has been prepared using a size of type large enough for the children to read easily. If necessary, enlarge the test on a photocopier and, for young children or those with coordination difficulties, considerably increase the space between test items.
- Administer at most only two tests at a time, with a break (e.g. recess) between the addition/subtraction tests and the multiplication/division tests. The multiplication and division tests would not normally be given to children below the age of seven years.
- Place the test sheet face down on the children's tables.
- The children write their name on the back of the sheet.
- You will later need to check the children's age in years and months.
- Say: `When you turn over the page you will find some addition (etc.) questions. When I say "start now" I want you to write down the answer to each question as quickly as you can. Don't worry if you don't finish them all. Work down the page. Pencils ready. Now turn over the page. Find the addition (adding) questions.' As soon as the children are ready, say `Start now'.
- After exactly one minute say `Stop! Pencils down'.
- Repeat the procedure for the subtraction test.
- Say `Don't forget, this is subtraction. You are taking the number away this time. One minute, starting now'.
- After one minute say `Stop! Pencils down'.

Addition	Subtraction	Multiplication	Division
2 + 1 =	2 – 1 =	1 x 2 =	2 ÷ 1 =
1 + 4 =	5 – 1 =	2 x 3 =	4 ÷ 2 =
2 + 2 =	3 – 2 =	2 x 5 =	3 ÷ 1 =
4 + 2 =	5 – 3 =	1 x 4=	6 ÷ 3 =
3 + 4 =	6 – 2 =	3 x 2 =	8 ÷ 2 =
2 + 3 =	2 – 2 =	4 x 3 =	9 ÷ 3 =
5 + 2 =	6 – 4 =	9 x 1 =	10 ÷ 2 =
4 + 5 =	7 – 2 =	6 x 2 =	12 ÷ 3 =
3 + 5 =	6 – 1 =	3 x 4 =	15 ÷ 5 =
2 + 8 =	7 – 3 =	5 x 3 =	16 ÷ 4 =
4 + 4 =	8 – 2 =	7 x 2 =	18 ÷ 3 =
2 + 5 =	7 – 5 =	3 x 6 =	20 ÷ 4 =
3 + 3 =	6 – 6 =	2 x 8 =	21 ÷ 3 =
1 + 8 =	8 – 3 =	4 x 5 =	24 ÷ 4 =
6 + 4 =	7 – 4 =	9 x 2 =	30 ÷ 3 =
3 + 7 =	9 – 3 =	3 x 7 =	30 ÷ 5 =
6 + 3 =	8 – 5 =	6 x 4 =	24 ÷ 8 =
5 + 5 =	9 – 5 =	3 x 9 =	27 ÷ 3 =
1 + 5 =	9 – 9 =	8 x 3 =	50 ÷ 5 =
6 + 2 =	10 – 4 =	7 x 0 =	28 ÷ 4 =
2 + 7 =	9 – 4 =	8 x 4 =	32 ÷ 8 =
4 + 6 =	10 – 3 =	5 x 6 =	35 ÷ 5 =
5 + 7 =	11 – 2 =	4 x 7 =	42 ÷ 6 =
8 + 3 =	10 – 6 =	8 x 6 =	45 ÷ 5 =
4 + 9 =	12 – 3 =	7 x 5 =	48 ÷ 8 =
7 + 6 =	12 – 6 =	9 x 4 =	54 ÷ 6 =
6 + 6 =	15 – 5 =	8 x 9 =	36 ÷ 9 =
8 + 6 =	11 – 5 =	7 x 7 =	56 ÷ 7 =
9 + 8 =	13 – 3 =	6 x 9 =	64 ÷ 8 =
6 + 9 =	12 – 9 =	8 x 8 =	63 ÷ 9 =
8 + 7 =	14 – 6 =	6 x 8 =	72 ÷ 8 =
9 + 5 =	17 – 8 =	9 x 9 =	81 ÷ 9 =
9 + 7 =	16 – 9 =	9 x 7 =	88 ÷ 8 =

Norm tables for the basic number facts tests

Addition

Age (years)	Average score	Normal range	Critically low score
6.0	4.0	2 – 6	0
6.5	5.5	3 – 7	2
7.0	8.0	5 – 11	3
7.5	11.0	7 – 15	5
8.0	12.0	8 – 16	6
8.5	15.5	11 – 19	9
9.0	17.0	13 – 21	10
9.5	18.5	14 – 22	11
10.0	20.5	16 – 24	13
10.5	21.5	16 – 26	14
11.0	23.5	20 – 27	18

Subtraction

Age (years)	Average score	Normal range	Critically low score
6.0	3.0	1 – 5	0
6.5	4.0	2 – 6	1
7.0	6.5	3 – 9	2
7.5	8.0	5 – 11	3
8.0	9.0	6 – 12	4
8.5	12.0	8 – 16	6
9.0	13.0	9 – 17	7
9.5	15.0	11 – 19	8
10.0	16.5	12 – 21	10
10.5	18.0	13 – 23	11
11.0	21.0	17 – 25	14

Multiplication

Age (years)	Average score	Normal range	Critically low score
7.5	4.0	1 – 7	0
8.0	5.5	3 – 8	2
8.5	8.5	5 – 11	3
9.0	9.0	6 – 12	4
9.5	11.5	7 – 15	5
10.0	13.0	9 – 17	7
10.5	15.0	10 – 20	8
11.0	17.0	13 – 21	11

Division

Age (years)	Average score	Normal range	Critically low score
7.5	2.5	0 – 4	0
8.0	3.0	1 – 5	0
8.5	5.0	2 – 8	1
9.0	6.0	3 – 9	1
9.5	7.0	3 – 11	2
10.0	9.0	5 – 13	3
10.5	11.0	6 – 16	3
11.0	13.0	8 – 18	5

Email to Schools

Dear School Principal,

Our research team from the University of Newcastle is conducting a research study in Stage 2 children.

The aim of this research is to investigate the feasibility of embedding stage appropriate Martial arts training encompassing syllabus linked mathematics content at home for students in Stage 2. Study participants will be asked to participate in 3 x 10 minute sessions of mathematics/martial arts (per week) over a six week period in Term 1 2020 that promotes moderate to vigorous activity. Student participants will be asked to complete physical fitness assessments, fundamental movement skills assessments, an attitude to Mathematics questionnaire, a cognitive test, and the One Minute Basic Number Fact test at baseline and post-test.

Please let us know if you would be interested in participating in this research.

Thank you.

The Research Team.

Transcript

Interviewer: Thank you for being so patient, guys.

Child 9: No Problem.

Interview: Sorry it's...you guys are awesome.

Child 9: Do I get another ice block?

Interviewer: Do you? Umm…

Child 4: I…I want a ice block

Interviewer: Probably not today. Alrighty. So – we're on! So this is the *last* thing that we've got to do before you are free to go. I have a few questions for everyone, and rather than interviewing you all at once – sorry - separately. We are just going to have a bit of a discussion between all of us. Does that make sense?

All: Yes

Interviewer: Okay, so you are all allowed to answer – just not all at the same time, okay? So… we don't want to talk over the top of each other, so if you want to answer the question, I really want to hear what you have to say, so

Child 9: [Raises hand]

Interviewer: Hand up - Exactly.

All of these questions are for everyone, so if you've got an answer, hands up.

"Number 1: When you first heard that Kick-Smart Homework was coming to your school, what did you think?" – how did you feel?

[Several students raise hand]

Child 13: Interested

Interviewer: Interested? Cool, very good. Anything else? [Child 11's name]?

Child 11: Wondered what it is.

Interviewer: Yeah? Cool.

Child 9: I wondered what it is and I felt kind of excited

Interviewer: Felt excited? Great. What about you [Child 4's name]?

Child 4: Happy.

Interviewer:	Happy? Awesome. So when I told you about what it was, you found out what it was - what did you feel then, when I told you what *Kick-Smart Homework* was?
Child 2:	I felt very excited.
Interviewer:	Very excited. Cool, I like that word. How about you [Child 3's name]
Child 3:	Happy.
Interviewer:	Happy? Cool. [Child 9's name].
Child 9:	I was excited.
Interviewer:	Cool. Still excited.
Child 11:	I was *over-excited*! Cause it sounded fun.
Interviewer:	It sounded fun. What else?
Child 13:	Extremely excited.
Interviewer:	Extremely excited. I love these words. Great, fantastic, alright…
	"Question 2: Did you understand what you were expected to do to complete the programme?"
	When we came in here and described it and we had that chat at the very start of the term, did you understand what you needed to do to do it every week?
Child 3:	Sort of.
Interviewer:	Okay. [Child 7's name]
Child 7:	Umm…sort of.
Interviewer:	Sort of. [Child 4's name]
Child 4:	Sort of…
Interviewer:	Sort of. Not fully though - right?
Child 9:	Yes. Definitely.
Interviewer:	Yes, you did? You did definitely understand what to do?
Child 9:	Yes.
Interviewer:	Great. [Child 11's name]?
Child 11:	A lot.
Interviewer:	A lot? You did understand?
Child 11:	[Nods head in agreement]
Child 13:	Hell yes?

Interviewer: Pardon? Yep…you did understand

Child 13: [Nods head in agreement]

Interviewer: So most people…hands up who *did* understand what to do when we described it. When we took you in here and showed you the program and what you needed to do.

[Child 4, 7, 8, 9, 10, 11, 13 raise their hands]

Interviewer: Hands up who was a little bit confused…

[Child 2, 3, 4, 5, 7, 10 and 12 rise their hands]

Interviewer: Alright cool. Hands down. So after we had that chat: *"Tell me about what you expected the programme [to be] to be like"* What did you expect to see in the programme? [Child 4's name]

Child 4: Soccer [points out soccer balls in equipment pile]

Interviewer: What's over there?

Child 4: The balls.

Interviewer: Balls. So you expected to kick some balls around.

Child 4: I want to play soccer with my friends.

Interviewer: Cool. Yes?

Child 7: Sport.

Interviewer: Sorry? Oh Sport? You expected some sport to be in it. Great. [Child 3's name]

Child 3: [Mumbles "skipping"]

Interviewer: Pardon?

Child 3: Skipping.

Interviewer: Skipping - Cool. [Indicates for Child 11 to share]

Child 11: Umm…sport mixed with maths.

Interviewer: …mixed with maths.

Child 13: Same as [Child 11].

Interviewer: Same as [Child 11]. Sport mixed with maths. Good.

Child 9: Same as [Child 13] and [child 11]

Interviewer: Yeah.

Child 8: Ooh, exercise.

Interviewer: Yeah, exercise. So, some physical exercise.

[Child 4 begins making bubbling sound with finger in mouth]

Child 5: [Inaudible]

Interviewer: Pardon? I can't hear over [Child 4]

[Child 4 stops making sound]

Child 5: Throwing

Interviewer: Throwing? Yeah. Throwing and some catching. Great. Anything else that was a little bit more specific than just sport in general? What there something about the *Kick*-Smart Homework that maybe…

Child 13: Running. Running laps and stuff.

Interviewer: Yeah, yep.

Child 9: I thought we'd be kicking stuff

Interviewer: Kicking stuff - like martial arts-y sort of stuff? Like that?

Child 9 [Nods head in agreement]

Interviewer: Yeah. Did anyone else expect to do some martial arts in there?

[Child 5, 7, 11 raise hands]

Interviewer: Yeah? Perfect. Alright, *"Was it what you expected it to be?"* Was it like what you expected?

[Child 4, 5, 7, 9, 11 hold hand out flat and tilt side to side indicating 'partially']

Interviewer: Kind of - Sort of?

Child 1: I didn't do the homework. You've got the wrong person.

Interviewer: Are you [Child 1]?

Child 1: Yes. But I didn't…you didn't give me the homework.

Child 3: Her name isn't up there…[indicates to board with test group names on it]

Interviewer: You are absolutely correct. You are free to go if you like. You are welcome stay if you want, but that's okay.

[Students distracted by the board and the confusion]

Interviewer: Alrighty, eyes back on me. Its alright, I put her name is the wrong spot on my sheet here. Its alright.

So – was it like you expected it to be. When I told you about Kick-Smart, it's got martial arts and activities. The kicking, the sport, and a bit of maths, was it how you expected or different?

Child 3: [Nods head in agreement]

Child 2: Um…Sorta…

Interviewer: Sort of how you expected? How was it different?

Child 2: Didn't expect to do the jumping and stuff…

Interviewer: You didn't expect to do the jumping? Okay, cool. Anything else [to Child 3 with arm raised]

Child 3: I forgot now

Interviewer: That's alright. [Child 4's name]?

Child 4: Sort of, but I was *meant* to be doin' the Karate.

Interviewer: Yeah, that's alright. So there wasn't enough Karate in it – Is that what you thought? Or…

Child 4: Yeah, we didn't really get to do the Karate.

Interviewer: You didn't really get to do the Karate stuff? Alright, cool…[Child 9's name]

Child 9: I was kind of…[inaudible]

[Child 4 begins making noises]

Interviewer: Sorry, I can't h… [Child 4's name], I need you to sit up buddy. You're a little bit too loud for [Child 9's name].

Child 9: It was kind of what I though.

Interviewer: Kind of what you thought? What wasn't what you thought it was going to be?

Child 9: I thought we were going to, like, I thought we were gonna do, like kicking a lot of stuff, and not doing the jumping as well.

Interviewer: Sure, alright. Fair enough. [Child 11's name]

Child 11: It was like I expected.

Interviewer: Yep. Great. Alright.

Child 13: Same.

Interviewer: It was exactly how you expected it to be?

Child 13: [Nods head in agreement]

Interviewer: Awesome. Alright - "*Did you complete the entire programme?*" - So, all three sessions, for all six weeks. Put your hand up if you did do that…You did all of them, and you brought back the page every week for the ones that you completed, with the feedback form…

[Child 11 and 13 raise hands]

Interviewer: So, two? That's alright. Hands up if you *didn't* do the whole thing. Be honest, its fine, you're not in trouble. Its just, we just want to find out who did do it.

[Child 2, 3, 4, 5, 7, 8, 9, 10, 12 raise their hands]

Interviewer: That's alright. Cool. So - let's start with…let's start with the two that *did* do it. Why did you do the whole thing? Was there a reason that you really wanted to, and stuck with the whole thing?

Child 13: Because I knew I would've been able to do something besides X-box, because I've barely got nothing in my room.

Interviewer: Great, yeah, so it gave you something to do at home rather than playing games. Would you say it gave you some more physical activity at home? Is that sort of why you did it?

Child 13: Yeah.

Interviewer: Yeah, great. [Child 11's name]

Child 11: Because it's better than my other homework.

Interviewer: Better than your other homework? A bit more fun?

Child 11: [Nods head in agreement]

Interviewer: What did you like about it compared to your other homework?

Child 11: Umm…that it was easier because I didn't have to write…

Interviewer: …great, yeah. So you didn't have to do the…any writing. SO you just had to say it in your head. Cool, fantastic.

Alright - now, with everyone else - why didn't you do it? Hands up. Is there a particular why reason you didn't do it [Child 9's name]?

Child 9: Well, one week I was away so I couldn't do it…and then, like, the rest I forgot.

Interviewer: Fair enough. SO you just forgot. [Child 10's name]?

Child 10: I forgot

Interviewer: You forgot. Yeah.

Child 8: Umm, sometimes I just didn't have enough spare time

Child 9: Same

Interviewer: So you ran out of time at home to do it. What was taking up the time, do you think?

Child 8: We've just been busy. Some nights we um, went over to my neighbour's house for dinner, or we went out to see someone, or…yeah.

Interviewer: Sure. Alright, [Child 7's name]?

Child 7: Forgot.

Interviewer: You forgot. That's alright. [Child 4's name]?

Child 4: Too much X-box games.

Interviewer: Too much X-box and not enough physical activity. Fair enough. SO you wanted to play your X-box instead of doing homework?

Child 4: [Nods head in agreement] yep.

Interviewer: Fair enough. That's alright. [Child 3's name]?

Child 3: Like, we went away a bit too much to my Aunties house and that, so I didn't get time to do it, and then after that, we went out for dinner and that…

Interviewer: That's alright. So you just didn't have enough time at home to get it done. Cool, [Child 2's name]

Child 2: Well, one time I was making something, and the next day I forgot to, um, bring it home.

Interviewer: Ah…fair enough, so you forgot to bring the equipment home. Alright. Great answers so far. I'm just going to make sure that's still recording, to make sure we're no forgetting to do any of this sort of stuff. Beautiful! Cool.

Child 4: Are we done?

Interviewer: No, we're about half way. But you guys are going so well with this.

Child 4: You've got to be kidding me!

Interviewer: I know, but it's about 10 minutes. Okay, so, next question, which we sort of answered already – "*Did you remember to take the equipment home, and bring it back to school?*"

So hands up if you *did* remember.

[Child 11 and 13 raise their hands]

Child 9: Only once.

Interviewer: Only once. That's alright. So, why did you remember? How did you remember to remind yourself to do it? What was the reason you did it?

Child 13: Because I had to put it in my bag before I went back to the, like, school.

Interviewer: Sure, so did you remind yourself, or did someone at home remind you?

Child 13: I remembered.

Interview: Yeah, so you reminded yourself. That's great. [Child 11's name]?

Child 11: Umm, because I…just…kept remembering to bring it back, and get it.

Interviewer: So you did it every…every day, so it was just stuck in your mind, so it was a bit of a routine? Great. Anyone else that did it more than…did anyone do it more than once, other than these two [children]? Yeah, [Child 2's name]?

Child 2: Umm, well, I…as soon as I woke up, I put it at the door so I don't…forget it.

Interviewer: That's a great idea. So you remembered by putting it at the front door once you finished. Great, alright - What made it hard to remember? Was there anything that made it more difficult to…bring it back? So for the people that either left their equipment at home, or forgot to take it home, what were some of the reasons, do you think?

Child 3: [Inaudible]

Interviewer: Oh, so you were a bit rushed to get home so you didn't have a chance to bring it. [Child 4's name].

Child 4: I kept forgetting to [inaudible due to road noise]

Interviewer: Oh, okay. Sure.

Child 7: Um, because I was too busy getting ready for school.

Interviewer: TO busy getting ready for school. Okay, that's alright.

Child 8: Um, I just probably had so much on my mind that I couldn't think properly.

Interviewer: So much on your mind that you couldn't think properly. That's a good answer. So, at school or at home?

Child 8: Both.

Interviewer: Both. There's too much to think about, and this was just another addition to the pile.

Child 8: Yeah.

Interviewer: Cool, [child 9's name]?

Child 9: Um, I had a few things going on… I…yeah…it was just too…yeah.

Interviewer: It was just one more extra thing that you didn't want to think about…cool. That's alright. Beautiful, alright - "*How did you feel about the length of the program?*" So, it went for six weeks - How did you feel about that? Let's start from this end…

Child 13: [muffled by road noise] Healthier.

Interviewer: Pardon?

Child 13: Healthier.

Interviewer: Healthier? Yeah. So, was it…the length of it…was it long? Too short, too long? Just right?

Child 13: Just right.

Interviewer: Just right? Yeah, [Child 11's name]

Child 11: Good.

Interviewer: It was good?

Child 11: Yeah.

Interviewer: Great.

Child 5: Good.

Interviewer: Yeah? You thought it was long enough.

Child 5: [Nods head in agreement]

Interviewer: Cool. [Child 4's name]?

Child 4: Kind of.

Interviewer: Kind of? Can you tell me a bit more about that? Why you think it was kind of okay…how come?

Child 4: Because I kept getting distracted wanting to do other things so it was kind of okay.

Interviewer: Okay, so it was a bit too long to keep remembering to do it every day. Is that what you mean?

Child 4: [Nods head in agreement]

Interviewer: Yep.

Child 3: A bit too long.

Interviewer: A bit too long. Alright, how long would you make it, do you think?

Child 3: Um, probably about…4 weeks.

Interviewer: 4 weeks? Cool, alright. Great answer. [Child 2's name]

Child 2: Um, good.

Interviewer: Yeah? You thought the 6 weeks was long enough? Great. [Child 7's name]?

Child 7: Good.

Interviewer: Yeah? You were happy with the 6 weeks as well. Awesome!

"*Question 7 - What was it like doing the program at home?*" Let's start at this end this time. [Child 2's name].

Child 2: Good.

Interviewer: Yeah? Tell me a little bit more about it. What…what did it look like when you were doing it?

Child 2: Um… I forgot.

Interviewer: You forgot? That's alright. So what was it like doing it at home? Did someone help you? Were you doing by yourself? Did you do it in your room? Did you do it in the garage? Did you do it in the back yard? That sort of thing. How did you go?

Child 3: Um, well…I did it in my house.

Interviewer: Yeah. Inside?

Child 3: Yeah, and I tried to go outside but my little sisters and brothers kept annoying me, so I didn't get a chance to do it properly.

Interviewer: So some of your brothers and sisters got in the way. Sure. [Child 4's name]?

Child 4: I went inside with my mum, and then we catched the ball.

Interviewer: Inside, yep. So your mum helped you with it? Awesome! Great, that's good to hear. [Child 7's name]?

Child 7: I did out back…back…

Interviewer: Pardon?

Child 7: I did it out in the back yard.

Interviewer: Out in the back yard. Awesome. What…did anyone help you with it out in the back yard?

Child 7: Mum

Interviewer: Mum. Great.

Child 4: Same as mine!

Interviewer: [Child 9's name?]

Child 9: Um, It was fun and exciting. I did it in the back yard, and my mum and my dad helped me.

Interviewer: Fantastic, so both parents just jumped in and gave you a hand. Awesome.

Child 9: [Inaudible, due to noises made by Child 4]

Interviewer: Sweet. [Child 4's name]…you keep talking over the top of other people buddy. The camera isn't going to be able to hear everyone if you keep talking…

Alrighty [gestures towards Child 11].

Child 11: Um, I done it in my front yard, with

Interviewer: In your front yard.

Child 11: My brothers were doing it with me, and my mum was just keeping the scores.

Interviewer: Great. Yeah sure. So, lots of family members helped you out. Fantastic.

Child 13: By myself. But on catching, I just threw it, like, boun…like…threw it on to the wall, and…

Interviewer: Awesome, so you did the other idea I gave you. So if you couldn't find a family member, you threw it to the wall and caught it again?

Child 13: [Nods head in agreement]

Interviewer: Awesome. Great.

Fantastic…alright, um… "*Was it hard to get someone to help you at home?*" Hands up if you thought it was hard to get someone to help you do some of the programs at home…

[Child 2, 4, 5, 7, & 13 raise their hands]

Interviewer: Yeah? So: One, two, three, four, five…five people found it a little bit harder to get people to help you do it at home. So everyone else had someone to… sort of help?

Alright, what were the issues? Did anyone…does anyone remember why it was harder to get people to help you? Were they just not interested, or…? [Child 2's name]?

Child 2: My dad was at work, my mum was at work, my sister had a baby to put to sleep.

Interviewer: Sure - so both parents were at work and your sister had a baby to look after. SO it was just a little bit tricky to find [inaudible]. That's fir enough. Great. Great answer.

How did you go?

Child 3: I didn't need any help cause I did it by myself.

Interviewer: Sure. You did it by yourself. How did you do the throwing and catching activities?

Child 3: Um, I threw it to the wall and then catched it.

Interviewer: Great! You caught it when you threw it to the wall. Awesome. Same as [Child 13's name].

[Child 4's name]?

Child 4: It was hard.

Interviewer: It was hard? Okay, why was it hard to find someone to help you?

Child 4: Like if my dad was always on the couch watching TV, and never does anything with me.

Interviewer: Oh, so dad doesn't do anything with you?

Child 4: [Shakes head] and neither do my brothers.

Interviewer: Right, so your brothers don't help you either, so that's hard. Sure - alright

Child 7: My mum was busy cooking. My dad was busy doing work.

Interviewer: Doing work – fair enough. Just busy doing housework – cleaning and…

Child 7: And my sister was…just didn't want to help me.

Interviewer: Just didn't want to help?

Child 7: Mm-hmm

Interviewer: Sure.

Anyone else? [Child 13's name].

Child 13: It was hard for me cause mum has to cook dinner, and sometimes she doesn't know how to [inaudible], and, umm, [both brother's names] are useless, cause they're stupid.

Interviewer: So you didn't know how to do it? Did you ask someone how to do it?

Child 13: I asked [brother] how to do it, but he just hates me.

Interviewer: Ah, fair enough. SO you did ask, but he just didn't want to help you?

Child 13: And then dad - by the time he gets home, he just starts watching the news incase COVID got a bit worse or something.

Interviewer: Sure.

Child 13: And also cause he's at work for that long, half [inaudible] back home.

Interviewer: Sure. Dad's to exhausted when he gets home from work, to help you, and mums too busy cooking, and your brothers and sisters don't want to help you either?

Child 13: I don't have a sister.

Interviewer: Oh, just brothers.

Child 13: Yeah, she's my step-sister.

Interviewer: Ah, she's your step-sister. Sorry – my mistake.

Great, some great answers. Fantastic. Where are we up to?

Question 8: If you had any questions during the program, what were they?

So if there was something you didn't understand during the program, or something like that. Did anyone have anything like that to add?

Child 13: Um, with the soccer. Like, I only used the soccer match for when [friend] came for a play date at my house.

Interviewer: SO what was the question about the program?

Child 13: Um, I could only do the soccer, like, game at the, like, with [friend] on a play date, the soccer match. Then, um, for the free kicks and stuff…umm…

Interviewer: Sure. So was there anything in the Kick-Smart program that you didn't understand?

Child 13: No.

Interviewer: No? Great! Alright. Anyone else? Was there anything that you had a question about in the program that you didn't understand?

[Child 5 raises hand] Yeah, what was it?

Child 5: I didn't understand the ten times tables.

Interviewer: The ten times tables? Alright. Did you ask anyone about how to…

Child 5: Yes, I asked my mum and dad and they said they didn't know, and my little brother was the same [inaudible]. My big sister was just sittin' down watchin' TV. She don't want to help.

Interviewer: Alright, so you asked you family members, but they didn't know their ten times tables, so they couldn't help you?

Child 5: [Nods in agreement]

Interviewer: Alright, fair enough. Thank you for that.

Child 8: Um, this is for [Child 5's name]. If you want help, just count up by tens.

Interviewer: Yep, exactly. Yeah, thank you.

[Child 9's name]?

Child 9: No, just stretching. My arms are tired.

Interviewer: Just stretching - ha-ha - alright.

Question 9: After completing the Kick-Smart program, do you think you are more active now? What extra physical activity do you do now, if that's the case?

Does anyone feel like they are more active now? After doing it for so long?

[Child 2, 3, 4, 5, 7, 8, 9, 11 & 13 raised their hands]

Yeah? What else do you do now, after doing the Kick-Smart program?

Child 2: I play outside more.

Interviewer: Yeah, you play outside more? Is it because it gave you some more ideas?

Child 2: [Nods head in agreement]

Interviewer: Great. [Child 3's name]?

Child 3: Jumped on the trampoline.

Interviewer: Jumpined on the trampoline a bit more. Great. [Child 4's name]?

Child 4: Um, I play outside more with the kids - like my neighbour who brings his kids over.

Interviewer: Sure. Do you do some of the Kick-Smart activities with them?

Child 4: Mostly. We try to catch the ball, or we [inaudible]

Interviewer: Ahh - good. [Child 7's name]?

Child 7: Um, more, like [inaudible]

Interviewer: You're kicking the soccer ball a bit more at home, and practicing a bit more? Great! [Child 8's name]?

Child 8: Um, it getting me more into soccer. Awesome, yeah, so it gives you a bit more practice. [Child 9's name], is there anything that you are doing a bit more extra of? Cause you're pretty active.

Child 9: Um yeah, playing outside a with…playing [inaudible]

Interviewer: Great. [Child 9's name], anything to add?

Child 10: [Hesitates]….hmm…

Interviewer: You don't have to.

Child 10: Okay.

Interviewer: That's alright. [Child 10's name]?

Child 11: Running around outside and around my house, playing with my little sausage dog, instead of playing my Xbox all the time.

Child 4: Same as me!

Interviewer: Great, so you feel as though you are a little more active now that you've been practicing how to do that, instead of playing the Xbox all the time. Great.

Child 13: I've been running around outside, chasing my cat cause it keeps scratching me it the head.

[Whole group speaking or laughing - Inaudible]

Interviewer: Sure. Two questions to go! We're almost there, well done! So,

Question ten: After completing the Kick-Smart program, how do you feel about completing maths work?

How do you feel about maths now that you've done the program?

Child 11: A lot better.

Interviewer: a lot better? How come?

Child 11: Because it's a bit easier with my 9's tables and all the other times tables that I did.

Interviewer: Is that because you practiced them a bit more during the program?

Child 11: Yeah.

Interviewer: Fantastic! I'm glad to hear that. [Child 9's name]?

Child 9: Um, I just…I'm more excited to do it.

Interviewer: More excited?

Child 9: I used to think I didn't really like it before, but now doing its more fun.

Interviewer: Fantastic. So the kick-smart program made maths more fun. Is that right?

Child 9: Yep!

Interviewer: Oh, awesome. I'm glad to hear that. [Child 7's name]?

Child 7: It made it easier.

Interviewer: It made it easier? Why did it make it easier?

Child 7: Because there is a lot of maths things in the thing, so I know more about my times tables.

Interviewer: Sweet, so it got you practicing a bit more. Is that what you mean?

Child 7: Yep

Interviewer: Yep, sure. [Child 5's name]?

Child 5: Okay.

Interviewer: Okay? Yep- So did it help you much, or just okay?

Child 5: Just okay.

Interviewer: Yeah, alright. Great. [Child 4's name?]

Child 4: Happy.

Interviewer: It makes you happy about maths?

Child 4: Oh…now, cause I don't have to do it anymore.

Interviewer: Ah, because you're finished.

Child 4: Well, cause I don't like maths.

Interviewer: Oh, right. So you're happy that you've finished the program so you don't have to do it anymore. Is that right?

Child 4: [Nods]

Interviewer: Oh, okay. So the program didn't make maths a bit more fun for you?

Child 4: No!? I'm really happy to do writing.

Interviewer: Fair enough.

Child 3: It was a bit hard.

Interviewer: A bit hard? So the program made you feel worse about maths? DO you know why?

Child 3: No.

Interviewer: That's alright.

Child 2: A lot more easier.

Interviewer: A lot easier. I'm glad to hear that. How come?

Child 2: Because I didn't know my time tables, and I was practicing them.

Interviewer: Awesome. SO the program made you practice them three times a week, and you got a bit better at it. Awesome – I hope so.

Alrighty, last question.

Child 9: Yes!

Child 8: What is it?

Interviewer: What is it? I'll tell you! Did you enjoy the program?

Child 9: Yes!

[Seven of the eleven students raise their hand in agreement]

Child 8: Can we just say yes and we'll leave, ha-ha!

[Room laughs and speaks inaudibly]

Interviewer: We're almost there! So this is a three part question. We're going to go around and say 'What were your favourite parts of the Kick-Smart homework program?'

[Child 13's name], what was your favourite part?

Child 13: My favourite part was playing with the soccer ball game.

Inteviewer: Playing the soccer game. Great. [Child 11's name]?

Child 11: Doing the maths and doing the sport.

Interviewer: Yep. What parts of the sport together with the maths? Was there a favourite activity?

Child 11: The sprinting.

Interviewer: The sprinting? Great. Yeah, awesome. [Child 9's name]?

Child 9: Um, doing the skipping and chucking the ball and stuff.

Interviewer: Cool.

Child 8: Doing the…kicking the soccer ball.

Interviewer: The soccer ball. Great

Child 7: Kicking the soccer ball.

Interviewer: Yep, cool. [Child 4's name], ave you got anything to add to that question?

Child 4: [Shakes head]

Child 3: The ladder thing.

Interviewer: The step ladder, the footwork ladder. Awesome. That's one of my favourites as well.

Child 2: The footwork ladder.

Interviewer: The footwork ladder as well? Good!

Alright, were there any parts that you didn't enjoy? Let's start from this end. Yep?

Child 3: Um, the soccer.

Interviewer: The soccer. You didn't like the soccer? Cool.

Child 2: The soccer.

Interviewer: You didn't like the soccer either? Alright. [Child 4's name], was there any part of the program that you didn't like?

Child 4: Umm…basically every single one except the tennis ball and the soccer.

Interviewer: You liked playing with the balls though? That was your favourite part?

Child 4: [Nods head'

Interviewer: Great. Alright, was there any part of the activities that you didn't like?

Child 5: [Shakes head]

Interviewer: No? Okay.

Child 7; The skipping.

Interviewer: The skipping. You didn't like the skipping?

Child 7: [Shakes head]

Interviewer: Alright, cool. [Child 9's name]?

Child 9: The 7's times tables. I found them a bit tricky.

Interviewer: Yeah, fair enough. So you found the 7 times tables ha bit hard. Cool. [Child 8's name]?

Child 8: I found the 8 times tables hard.

Interviewer: Eight times tables? Yeah, eights can be a bit tricky at times.

[Child 10's name], was there anything that you…

Child 10: [Shakes head]

Interviewer: No? …you didn't do it at all, did you?

Child 10: Nup.

Interviewer: No?

Child 10: I forgot.

Interviewer: You forgot. That's okay. [Child 11's name]?

Child 11: No, there wasn't anything that I didn't enjoy.

Interviewer: Nothing you didn't enjoy at all? Awesome.

Guys, we are almost done. Just stay with me for a little bit longer.

[Inaudible]

[Child 13's name], was ther anything you didn't like mate?

Child 13: Nope.

Interviewer: No? You enjoyed it all?

Child 13: [Nods head]

Interviewer: Awesome. Alright, this, I promise is the very last question. So, focus. Take a big deep breath in…

[Whole group takes a deep breath in and out]

Would you change anything about the Kick-Smart program, if you were making it?

If you made the program, what would you change about it? [Child 10's name]?

Child 8: Let's all just say no and we leave.

Interviewer: ha-ha

Child 10: The maths.

Interviewer: The maths? Would you leave any maths in, or would you take it all out?

Child 10: Take it all out.

Interviewer: Take it all out? [Child 9's name]?

Child 9: Rainbows and unicorns.

Interviewer: Rainbows and unicorns…

Child 9: You gotta find rainbows and unicorns to be able to do it.

Interviewer: You gotta find…alright…that's an interesting answer. [Child 8's name], anything you'd like to share?

Child 8: No, not really.

Interviewer: Not really? [Child 7's name]?

Child 7: Nope.

Interviewer: Alright. [Child 4's name]?

Child 4: I would take every single thing out, and make it a big Xbox game.

Interviewer: Make it an Xbox game? Fair enough. Alright, here's a question for you. If there was an Xbox game that made you do physical activity, is that something you might want to do?

Child 4: Yeah, I'll make it play GTA [Grand Theft Auto] 5.

Interviewer: That's interesting…I don't think you're quite old enough to play that game just yet.

What would you change?

Child 3: Um, probably maths.

Interviewer: Take the maths? Yeah. Would you make the maths easier or just take it out completely?

Child 3: Easier.

Interviewer: Easier. Alright. What sort of easy maths would you put in? Is there anything in particular?

Child 3: [Shakes head]

Interviewer: No? Alright

Guys, thank you very much for your patience…I know it has been a long couple of days. Have a great afternoon.

Appendix 9: Kick-Smart Homework Project Assessments

Appendix D: Assessment protocols

1- 20m repeated shuttle run test (maximal effort test)
2- Standing jump test,
3- Push-up test (or modified push up test)
4- Fundamental Movement Skills
5- Trail Making Test
6- The One Minute Basic Number Fact Test

20m repeated shuttle run test (maximal effort test)

- The 20m Shuttle Run Test provides percentile scores for students aged 11-14 years. It is an international test adopted by the Australian Institute of Sport. The Australian Fitness Education Award provides standards to be achieved for students aged 9-18 years [1].

Student Objective

To run back and forth between two lines, 20m apart, within a set time limit. Running speed is increased by 0.5km/hr each minute using the 20m Shuttle Run Test cadence CD.

Notes

- The test requires maximal effort.
- The shuttles increase progressively - students are required to run until they can no longer keep up with the speed set by the tape.
- Students should not be discouraged if they finish earlier than others.
- Do not push students to exhaustion.

Interpretation of Results

- A score of 4.1 indicates a student has run one shuttle at Level 4. Record the level and the number of shuttles into that level.
- Scores should be compared with the appropriate sex and age related standards (see below).
- Students scoring at or above the set standard are considered to have the level of cardiorespiratory endurance needed to gain health benefits. These students should be encouraged to maintain or increase their cardiorespiratory endurance.
- Students scoring below the standard need to increase their cardiorespiratory endurance towards the criterion based standard.
- A low score may be determined by numerous factors. These include: aerobic capacity, growth, inability to pace, running/walking efficiency, unknown injury, motivation and environmental conditions.

Criterion-based Standards - (level & shuttle) - PAZ 1

Age	9	10	11	12	13	14	15	16	17	18
M	3.4	3.6	5.1	5.4	5.9	6.6	7.8	8.5	8.5	8.5
F	2.7	3.4	3.5	" 4.1	4.3	5.1	5.3	5.5	5.5	5.5

Criterion-based Standards - (level & shuttle) - PAZ 2

Age	9	10	11	12	13	14	15	16	17	18
M	4.1	4.6	6.0	6.4	6.6	7.5	8.8	9.3	9.6	9.6
F	3.4	3.9	4.4	4.8	5.3	5.7	6.0	6.3	6.6	6.6

Criterion-based Standards - (level & shuttle) - PAZ 3

Age	9	10	11	12	13	14	15	16	17	18
M	4.8	5.6	6.9	7.4	8.1	8.4	9.8	10.1	10.7	10.7
F	4.1	4.4	5.3	5.5	6.1	6.3	6.7	7.1	7.7	7.7

Standing broad jump test (muscular fitness lower limb [3,4]

Purpose:
To evaluate explosive strength of the lower limb body muscles

Student Objectives:
To jump as far as possible using a double foot jump from a standing / static start.

Equipment:

* Measuring tape

* Chalk / tape to mark starting line

Procedure

1) The athlete stands behind a line marked on the ground with feet slightly apart. A two foot take-off and landing is used, with swinging of the arms and bending of the knees to provide forward drive. The subject attempts to jump as far as possible, landing on both feet without falling backwards. The start of the jump must be from a static position.

2) The result will be recorded in metres.

3) A non-slip hard surface, chalk and a tape measure are used to perform the test.

4) 2 attempts will be performed with the longest jump being recorded. The measurement is taken from take-off line to the nearest point of contact on the landing (back of the heels).

90° Push-Up [2]

• The 90° push-up to an elbow angle of 90° is the recommended test for upper body strength and endurance. Test administration requires little or no equipment; multiple students may be tested at one time, and few zero scores result. This test also teaches students an activity that can be used throughout life as a conditioning activity as well as in self-testing. The 90° push-up has generally been shown to produce consistent scores but reliability depends on how it is administered.

Test Objective

• To complete as many 90° push-ups as possible at a rhythmic pace.

Equipment and Facilities

PHOTO 7.7 Starting position for

• The only equipment necessary is an audiotape with the recorded cadence or a metranome. The correct cadence is 20 90° push-ups per minute (1 90° push-up every 3 seconds).

Test Instructions

• The student being tested assumes a prone position on the mat with hands placed under or slightly wider than the shoulders, fingers stretched out, legs straight and slightly apart, and toes tucked under. The student pushes up off the mat with the arms until arms are straight, keeping the legs and back straight. The back should be kept in a straight line from head to toes throughout the test (photo 7.7). The student then lowers the body using the arms until the elbows bend at a 90° angle and the upper arms are parallel to the floor (photo 7.8). This move- ment is repeated as many times as possible. The student should push up and continue the movement until the arms are straight on each repetition. The rhythm should be approximately 20 90° push-ups per minute or 1 90° push-up every 3 seconds.

When to Stop

• Students are stopped when the second form correction (mistake) is made. Only one form correction is allowed.

Form Corrections

• Stopping to rest or not maintaining a rhythmic pace
• Not achieving a 90° angle with the elbow on each repetition
• Not maintaining correct body position with a straight back
• Not extending arms fully

SCORING

• The score is the number of 90° push-ups performed. For ease in administration, it is permissible to count the first incorrect 90° push-up. It is important to be consistent with all of the students and classes when determining if you will count the first incorrect push-up.

1. ACHPER, *Australian Fitness Education Award: Teacher's Handbook and Curriculum Ideas*. 2nd ed2004, South Australia: The Australian Council of Health Physical Education and Recreation. 61.
2. Welk, G.J. and M.D. Merideth, *FITNESSGRAM / ACTIVITYGRAM: Reference Guide*. 3rd, Edition ed2008, Dallas, TX: The Cooper Institute. 206.
3. Ortega, F.B., et al., *Reliability of health-related physical fitness tests in European adolescents. The HELENA study.* International Journal of Obesity, 2008(1-9).
4. Mackenzie, B., *101 Performance evaluation tests*, ed. B. Mackenzie2005, London: Jonathan Pye.

Trail Making test

From the MOCA: Montreal Cognitive Assessment

The Tests:

" The trail making tests A and B from the MOCA requires immediate recognition of the symbolic significance of number and letters, ability to scan the page continuously to identify the next number or letter in sequence, flexibility in integrating the numerical and alphabetical series, and completion of the these requirements under the pressure of time " (Reitan, 1992).

General Instructions

Trail Making Part A:

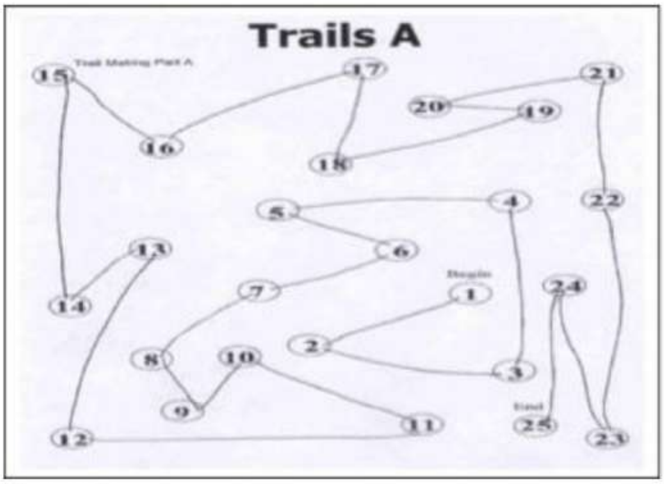
1. Provide the person with the sample trails A first. Once completed correctly then move on to the actual Trails A.

2. Instruct the individual to, "Please draw a line connecting the numbers 1, 2, 3, 4 etc. in order until you reach the end. Try to draw the lines as fast as you can."

3. If the person makes a mistake on the sample Trails A point it out to them and explain the error. i.e. "you skipped a circle; you started with the wrong number, etc." Repeat the sample Trails A with correction instructions until they have completed it correctly or it becomes evident that they are unable to do the task.

4. Once the sample trails A has been completed correctly give them the real Trails A. Repeat the instructions as given in step one.

5. Start timing the test as soon as the instruction is given to begin the test.



Example

Trail Making Part B:

1. Provide the individual with the sample Trails B. Once they have completed it correctly then move on to the actual Trails B.

2. Instruct the individual that this second part of the test is slightly more difficult as it requires them to alternate between numbers and letters. Say "On this page are some numbers and letters. Begin at 1 and draw a line from 1 to A, A to 2, 2 to B, and so forth until you reach the end. Remember first you have a number, then a letter, then a number, and so on. Draw the lines as fast as you can."

3. If the person makes a mistake on the sample Trails B, point out the error and explain why it is incorrect. Repeat this procedure until the task is performed correctly or it becomes apparent they cannot complete the task.

4. After the person has completed the sample Trails B provide them with the actual Trails B. Repeat the instruction given in point 2. Timing begins as soon as

the person is told to begin.

5. Be altert for mistakes. If the person makes a mistake point it out to them immediately, return the person to the last correct circle and continue the test from that point. Continue timing and record the number of errors made until task is completed

Scoring Trails A and B

1. Part A and B are scored separately. The score for each part is the number of seconds required to complete the task.

2. More than 1 error or scoring below the 10th percentile in the time (in seconds) taken raises concerns (50th percentile is given for comparison).

3. Generally time over 3 minutes or > 1 error is a failure.

Norms for Trails A and B by age (in seconds) and education		
Age Percentiles	Trails A* Trails B (education – no ≤Grade 12 >Grade 12* change)	
65- 50 69 10	37 seconds 86 53 137	68 77
70- 50 74 10	38 101 61 172	84 112
75- 50 79 10	46 120 70 189	81 178
80- 50 84 10	52 140 93 158	128 223

Fundamental Movement Skills

Test of Gross Motor Development–Third Edition

TGMD-3

Examiner Record Form–Norming

Dale A. Ulrich

Section 1. Identifying Information

Child's Name or ID #: ______________________

Examiner's Name: ______________ Affiliation: ______________ Examiner's Email Address: ______________

Date of Testing: ______________ Date of Birth: ______________

Gender: Male☐ Female☐ Age in Years: ______________ Child's Weight Status: Underweight☐ Normal☐ Overweight☐

Child's Residential Location: City☐ Suburb of City☐ Rural or Small Town☐ Preferred Hand: Right☐ Left☐ Not Established☐ Preferred Foot: Right☐ Left☐ Not Established☐

Section 2. Scoring Notes

- Directions for all test items require you to first give the child a good demonstration of the skill, which includes all of the performance criteria; give the child a practice trial, followed by two test trials that you score.
- Score each performance criterion as:
  - 1 = performs correctly
  - 0 = does not perform correctly
- **Performance criteria scores** are calculated by summing the score on trial 1 and trial 2 for each performance criterion.
- **Skill scores** are calculated by summing all of the performance criteria scores for each skill.
- The total **locomotor subtest score** is calculated by summing all 6 locomotor skill scores.
- The total **ball skills subtest score** is calculated by summing the 7 ball skill scores.
- The total **gross motor test score** is calculated by summing the total locomotor subtest score and the total ball skills subtest score.
- We have learned that test administrator bias occurs when the tester is unsure how to score a performance criterion. When testing a child, if you are unsure of whether the child performed a performance criterion correctly, administer another trial and just look at that performance criterion and score it.
- When testing children with a disability or very young children who appear to be distracted easily, it is recommended that you to have them stand on a small poly spot or other marker and tell them to stand on the marker and watch your demonstration. It is also helpful to use another poly spot or marker as the child's starting position for the locomotor skills. Giving these children more structure during your testing should be helpful.

Section 3. Subtest Performance Record

Locomotor Subtest

Skill	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
1. Run	60 feet (18.3 meters) of clear space to run, and two cones or markers	Place two cones 50 feet (15.2 meters) apart. Make sure there is at least 8–10 feet (2.4–3.1 meters) of space beyond the cone for a safe stopping distance. Tell the child to run fast from one cone to the other cone when you say, "Go." Repeat a second trial.	1. Arms move in opposition to legs with elbows bent			
			2. Brief period where both feet are off the surface			
			3. Narrow foot placement landing on heel or toes (not flat-footed)			
			4. Non-support leg bent about 90 degrees so foot is close to buttocks			
				Skill Score		
2. Gallop	25 feet (7.6 meters) of clear space, and two cones or markers	Place two cones 25 feet apart. Tell the child to gallop from one cone to the other cone and stop. Repeat a second trial.	1. Arms flexed and swinging forward			
			2. A step forward with lead foot followed with the trailing foot landing beside or a little behind the lead foot (not in front of the lead foot)			
			3. Brief period where both feet come off the surface			
			4. Maintains a rhythmic pattern for four consecutive gallops			
				Skill Score		
3. Hop	A minimum of 15 feet (4.6 meters) of clear space, and two cones or markers	Place two cones 15 feet apart. Tell the child to hop four times on his/her preferred foot (established before testing). Repeat a second trial.	1. Non-hopping leg swings forward in pendular fashion to produce force			
			2. Foot of non-hopping leg remains behind hopping leg (does not cross in front of)			
			3. Arms flex and swing forward to produce force			
			4. Hops four consecutive times on the preferred foot before stopping			
				Skill Score		
4. Skip	A minimum of 30 feet (9.1 meters) of clear space, and two cones or markers	Place two cones 30 feet apart. Mark off two lines at least 30 feet apart with cones/markers. Tell the child to skip from one cone to the other cone. Repeat a second trial.	1. A step forward followed by a hop on the same foot			
			2. Arms are flexed and move in opposition to legs to produce force			
			3. Completes four continuous rhythmical alternating skips			
				Skill Score		
5. Horizontal jump	A minimum of 10 feet (3.1 meters) of clear space, and tape or markers	Mark off a starting line on the floor, mat, or carpet. Position the child behind the line. Tell the child to jump far. Repeat a second trial.	1. Prior to take off both knees are flexed and arms are extended behind the back			
			2. Arms extend forcefully forward and upward reaching above the head			
			3. Both feet come off the floor together and land together			
			4. Both arms are forced downward during landing			
				Skill Score		

Ball Skills Subtest (*continued*)

Skill	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
4. Two-hand catch	A 4-inch (10.2-centimenter) plastic ball, 15 feet (4.6 meters) of clear space, and tape or a marker	Mark off two lines 15 feet apart. The child stands on one line and the tosser stands on the other line. Toss the ball underhand to the child aiming at the child's chest area. Tell the child to catch the ball with two hands. Only count a trial in which toss is near child's chest. Repeat a second trial.	1. Child's hands are positioned in front of the body with the elbows flexed			
			2. Arms extend reaching for the ball as it arrives			
			3. Ball is caught by hands only			
				Skill Score		
5. Kick a stationary ball	An 8–10 inch (20.3–25.4 centimeters) plastic, playground, or soccer ball; tape or a marker; a wall; and clear space for kicking	Mark off one line about 20 feet (6.1 meters) from the wall and a second line 8 feet (2.4 meters) beyond the first line. Place the ball on the first line closest to the wall. Tell the child to run up and kick the ball hard toward the wall. Repeat a second trial.	1. Rapid, continuous approach to the ball			
			2. Child takes an elongated stride or leap just prior to ball contact			
			3. Non-kicking foot placed close to the ball			
			4. Kicks ball with instep or inside of preferred foot (not the toes)			
				Skill Score		
6. Overhand throw	A tennis ball, a wall, and 20 feet (6.1 meters) of clear space	Attach a piece of tape on the floor 20 feet from the wall. Have the child stand behind the tape line facing the wall. Tell the child to throw the ball hard at the wall. Repeat a second trial.	1. Windup is initiated with a downward movement of hand and arm			
			2. Rotates hip and shoulder to a point where the non-throwing side faces the wall			
			3. Steps with the foot opposite the throwing hand toward the wall			
			4. Throwing hand follows through after the ball release, across the body toward the hip of the non-throwing side			
				Skill Score		
7. Underhand throw	A tennis ball, tape, a wall, and 15 feet (4.6 meters) of space	Attach a piece of tape 15 feet from the wall. Have the child stand behind the tape line facing the wall. Tell the child to throw the ball underhand and hit the wall. Repeat a second trial.	1. Preferred hand swings down and back reaching behind the trunk			
			2. Steps forward with the foot opposite the throwing hand			
			3. Ball is tossed forward hitting the wall without a bounce			
			4. Hand follows through after ball release to at least chest level			
				Skill Score		

Ball Skills Subtest Total Score ______

Total Gross Motor Score ______

4

Appendix

The One Minute Basic Number Facts Tests (1995)

The *One Minute Basic Number Facts Tests* are based on the performance of students in South Australian government schools in 1995. All scores in the norm tables have been rounded to the nearest 0.5 or nearest whole number.

In the norm tables the `normal range' column indicates the range of scores within which roughly 50% of the students in that particular age group would score. This range has been determined by using $\pm.68$ standard deviation.

The `critically low score' has been calculated from one standard deviation below the mean for the age group. Scores below this critical level place a student in approximately the bottom 16% of students in that age group.

The test-retest reliability of the One Minute Basic Number Facts Tests ranges from .88 to .94 according to age level.

Instruction for administration

- Ensure that the test material has been prepared using a size of type large enough for the children to read easily. If necessary, enlarge the test on a photocopier and, for young children or those with coordination difficulties, considerably increase the space between test items.
- Administer at most only two tests at a time, with a break (e.g. recess) between the addition/subtraction tests and the multiplication/division tests. The multiplication and division tests would not normally be given to children below the age of seven years.
- Place the test sheet face down on the children's tables.
- The children write their name on the back of the sheet.
- You will later need to check the children's age in years and months.
- Say: `When you turn over the page you will find some addition (etc.) questions. When I say "start now" I want you to write down the answer to each question as quickly as you can. Don't worry if you don't finish them all. Work down the page. Pencils ready. Now turn over the page. Find the addition (adding) questions.' As soon as the children are ready, say `Start now'.
- After exactly one minute say `Stop! Pencils down'.
- Repeat the procedure for the subtraction test.
- Say `Don't forget, this is subtraction. You are taking the number away this time. One minute, starting now'.
- After one minute say `Stop! Pencils down'.

One Minute Tests of Basic Number Facts

Addition	Subtraction	Multiplication	Division
2 + 1 =	2 – 1 =	1 x 2 =	2 ÷ 1 =
1 + 4 =	5 – 1 =	2 x 3 =	4 ÷ 2 =
2 + 2 =	3 – 2 =	2 x 5 =	3 ÷ 1 =
4 + 2 =	5 – 3 =	1 x 4=	6 ÷ 3 =
3 + 4 =	6 – 2 =	3 x 2 =	8 ÷ 2 =
2 + 3 =	2 – 2 =	4 x 3 =	9 ÷ 3 =
5 + 2 =	6 – 4 =	9 x 1 =	10 ÷ 2 =
4 + 5 =	7 – 2 =	6 x 2 =	12 ÷ 3 =
3 + 5 =	6 – 1 =	3 x 4 =	15 ÷ 5 =
2 + 8 =	7 – 3 =	5 x 3 =	16 ÷ 4 =
4 + 4 =	8 – 2 =	7 x 2 =	18 ÷ 3 =
2 + 5 =	7 – 5 =	3 x 6 =	20 ÷ 4 =
3 + 3 =	6 – 6 =	2 x 8 =	21 ÷ 3 =
1 + 8 =	8 – 3 =	4 x 5 =	24 ÷ 4 =
6 + 4 =	7 – 4 =	9 x 2 =	30 ÷ 3 =
3 + 7 =	9 – 3 =	3 x 7 =	30 ÷ 5 =
6 + 3 =	8 – 5 =	6 x 4 =	24 ÷ 8 =
5 + 5 =	9 – 5 =	3 x 9 =	27 ÷ 3 =
1 + 5 =	9 – 9 =	8 x 3 =	50 ÷ 5 =
6 + 2 =	10 – 4 =	7 x 0 =	28 ÷ 4 =
2 + 7 =	9 – 4 =	8 x 4 =	32 ÷ 8 =
4 + 6 =	10 – 3 =	5 x 6 =	35 ÷ 5 =
5 + 7 =	11 – 2 =	4 x 7 =	42 ÷ 6 =
8 + 3 =	10 – 6 =	8 x 6 =	45 ÷ 5 =
4 + 9 =	12 – 3 =	7 x 5 =	48 ÷ 8 =
7 + 6 =	12 – 6 =	9 x 4 =	54 ÷ 6 =
6 + 6 =	15 – 5 =	8 x 9 =	36 ÷ 9 =
8 + 6 =	11 – 5 =	7 x 7 =	56 ÷ 7 =
9 + 8 =	13 – 3 =	6 x 9 =	64 ÷ 8 =
6 + 9 =	12 – 9 =	8 x 8 =	63 ÷ 9 =
8 + 7 =	14 – 6 =	6 x 8 =	72 ÷ 8 =
9 + 5 =	17 – 8 =	9 x 9 =	81 ÷ 9 =
9 + 7 =	16 – 9 =	9 x 7 =	88 ÷ 8 =

Norm tables for the basic number facts tests

Addition

Age (years)	Average score	Normal range	Critically low score
6.0	4.0	2 – 6	0
6.5	5.5	3 – 7	2
7.0	8.0	5 – 11	3
7.5	11.0	7 – 15	5
8.0	12.0	8 – 16	6
8.5	15.5	11 – 19	9
9.0	17.0	13 – 21	10
9.5	18.5	14 – 22	11
10.0	20.5	16 – 24	13
10.5	21.5	16 – 26	14
11.0	23.5	20 – 27	18

Subtraction

Age (years)	Average score	Normal range	Critically low score
6.0	3.0	1 – 5	0
6.5	4.0	2 – 6	1
7.0	6.5	3 – 9	2
7.5	8.0	5 – 11	3
8.0	9.0	6 – 12	4
8.5	12.0	8 – 16	6
9.0	13.0	9 – 17	7
9.5	15.0	11 – 19	8
10.0	16.5	12 – 21	10
10.5	18.0	13 – 23	11
11.0	21.0	17 – 25	14

Multiplication

Age (years)	Average score	Normal range	Critically low score
7.5	4.0	1 – 7	0
8.0	5.5	3 – 8	2
8.5	8.5	5 – 11	3
9.0	9.0	6 – 12	4
9.5	11.5	7 – 15	5
10.0	13.0	9 – 17	7
10.5	15.0	10 – 20	8
11.0	17.0	13 – 21	11

Division

Age (years)	Average score	Normal range	Critically low score
7.5	2.5	0 – 4	0
8.0	3.0	1 – 5	0
8.5	5.0	2 – 8	1
9.0	6.0	3 – 9	1
9.5	7.0	3 – 11	2
10.0	9.0	5 – 13	3
10.5	11.0	6 – 16	3
11.0	13.0	8 – 18	5

Appendix 10: Kick-Smart Homework school invitation email

Email to Schools

Dear School Principal,

Our research team from the University of Newcastle is conducting a research study in Stage 2 children.

The aim of this research is to investigate the feasibility of embedding stage appropriate Martial arts training encompassing syllabus linked mathematics content at home for students in Stage 2. Study participants will be asked to participate in 3 x 10 minute sessions of mathematics/martial arts (per week) over a six week period in Term 1 2020 that promotes moderate to vigorous activity. Student participants will be asked to complete physical fitness assessments, fundamental movement skills assessments, an attitude to Mathematics questionnaire, a cognitive test, and the One Minute Basic Number Fact test at baseline and post-test.

Please let us know if you would be interested in participating in this research.

Thank you.

The Research Team.

Appendix 11: Martial arts in schools questionnaire

MARTIAL ARTS IN SCHOOLS

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

FEASIBILITY QUESTIONNAIRE

JUNE – 2020

IN INVESTIGATION INTO THE FEASIBILITY OF INCORPORATING MARTIAL ARTS IN THE CLASSROOM ENVIRONMENT

Aims of this survey:

a) To gain an understanding of the views and beliefs of current and pre-service (currently studying an undergraduate degree in education) teachers regarding martial arts in general

b) To gain an understanding of the views and beliefs of current and pre-service regarding the inclusion of martial arts in school settings.

c) To investigate whether any variability in views and beliefs exist across demographic groups (e.g. sex, age, perceptions of school climate, teaching experience, perceived fitness level, previous martial arts experience).

For all intents and purposes of this questionnaire, please refer to the following definitions:

Term	*Definition*
Martial arts	A term that encompasses the various forms/types/styles of combat sports and fighting practices (Cynarski & Skowron, 2014). For this questionnaire, this also term includes all self-defence techniques, and western combat sports e.g. Boxing.
Wellbeing	One's state of fulfilment, emotions, resilience and belonging, which can be affected by life events and challenges (Campion & Nurse, 2007; Treptow, 2017)
Primary School	An educational setting for students in Kindergarten to Sixth Grade (also known as elementary school).
Physical Activity	Any bodily movement produced by skeletal muscles that requires energy expenditure (World Health Organization, 2019).
Numeracy	Involves using mathematical ideas effectively to participate in daily life and make sense of the world. It incorporates the use of numerical, spatial, graphical, statistical and algebraic concepts and skills in a variety of contexts and involves the critical evaluation, interpretation, application and communication of mathematical information in a range of practical situations (NSW Government, 2007b)
Literacy	The ability to understand and evaluate meaning through reading, writing, listening and speaking, viewing and representing (NSW Government, 2007a)
Fitness	The condition of being physically fit and healthy.
Undergraduate	A university student who has not yet completed their first degree

DEMOGRAPHIC INFORMATION

	Statements	Answers							
1	Gender	Male	Female	Other					
2	Age group	18-24	25-34	35-44	45-54	55+			
3	How do you feel about the following statement? I consider myself to be physically fit	**Strongly Disagree**	**Disagree**	**Unsure**	**Agree**	**Strongly Agree**			
4	How long have you spent consistently (>1x per week) participating / training in a martial art?	**I have NEVER participated in ANY form of martial art**	**0-6 months**	**1-2 years**	**2-5 years**	**5+ years**			
6	If you are an **undergraduate student**, what year of study are you currently in?	**1st Year**	**2nd Year**	**3rd Year**	**4th Year**	**N/A**			
7	What area of education have you studied, or are currently studying?	**Primary & Early Childhood Education**	**Primary Education**	**Secondary Teaching (PDHPE)**	**Secondary teaching (other)**	**N/A**			
	Undergraduates and non-qualified / non-practicing teachers **skip to beliefs** section								
	Qualified (& practicing) Teachers								
9	What levels of stages of schooling are offered at your school?	**Early Stage 1**	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**	**Stage 5**	**Stage 6**	**N/A**
10	Is your school a public school, or a private school?	**Public** This is a school managed directly or indirectly by a public education authority, government agency, or governing board appointed by government or elected by public franchise	**Private** This is a school managed directly or indirectly by a non-government organisation; e.g., a church, trade union, businesses, other private institutions						
11	What stage(s) do you currently teach? Select any that apply.	**Early Stage 1**	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**	**Stage 5**	**Stage 6**	**N/A**
12	**If** you teach a specific subject, what subject do you currently teach?	....	**N/A**						
13	How many years have you been working in schools as a teacher?	**0-2 Years**	**3-5 Years**	**6-10 Years**	**> 10 Years**	**N/A**			
14	How much time (per week) does your school allocate to practical Physical Education for each student?	**N/A**	**Unsure**	**<30 Minutes**	**31-44 Minutes**	**45-60 Minutes**	**61-90 Minutes**	**>90 Minutes**	
15	On average, how much time (per week) do you allocate to Sport at your school?	**<30 Minutes**	**31-44 Minutes**	**45-60 Minutes**	**61-90 Minutes**	**>90 Minutes**			

School Climate							
1	To what extent do you believe that behavioural issues (e.g. bullying, violence, disrespect, vandalism) is an issue in your school?		**Strongly Disagree**	**Disagree**	**Unsure**	**Agree**	**Strongly Agree**
2	To what degree do you think behavioural issues impact negatively on learning in the classroom		**Strongly Disagree**	**Disagree**	**Unsure**	**Agree**	**Strongly Agree**
3	**Do you consider any of the following a barrier for teaching martial arts in your school**						
	Tick/circle one box for each row		Is NOT a barrier		Unsure	IS a barrier	
			Strongly Disagree	**Disagree**	**Unsure**	**Agree**	**Strongly Agree**
3.1	a)	Insufficient equipment for teachers to use	**1**	**2**	**3**	**4**	**5**
3.2	b)	Insufficient equipment for students to use	**1**	**2**	**3**	**4**	**5**
3.3	c)	Out-dated equipment	**1**	**2**	**3**	**4**	**5**
3.4	d)	Damaged and/or poor quality equipment	**1**	**2**	**3**	**4**	**5**
3.5	e)	Not enough variety of equipment	**1**	**2**	**3**	**4**	**5**
3.6	f)	Problems scheduling time in appropriate school areas (e.g. basketball court, fields, etc) for each class.	**1**	**2**	**3**	**4**	**5**
3.7	g)	No time in teachers schedule to explore opportunities for teaching new types of Physical Education	**1**	**2**	**3**	**4**	**5**
3.8	h)	Lack of interest/willingness of teachers to teach martial arts	**1**	**2**	**3**	**4**	**5**
3.9	i)	Teachers' lack of knowledge/skills in teaching Physical Education	**1**	**2**	**3**	**4**	**5**
3.10	j)	Teachers' lack of knowledge/skills in teaching Martial Arts	**1**	**2**	**3**	**4**	**5**
3.11	k)	Not enough training opportunities for teachers	**1**	**2**	**3**	**4**	**5**

BELIEFS (Undergraduates continue here)						
Statements		Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
1	I believe martial arts training has a place in a primary school setting	1	2	3	4	5
2	I believe martial arts training has a place in a high school setting	1	2	3	4	5
3	I think all primary school-aged students should have the opportunity to try martial arts training	1	2	3	4	5
4	I think all high school-aged students should have the opportunity to try martial arts training	1	2	3	4	5
5	I believe the NSW K-10 PDHPE Syllabus lends itself to the incorporation of martial arts	1	2	3	4	5
6	I believe the NSW Department of Education promotes martial arts as an acceptable in-school sport	1	2	3	4	5
7	Incorporating physical activity of any kind into the instruction of Key Learning Areas (KLA's) such as Mathematics or English could be beneficial for students	1	2	3	4	5
8	Incorporating martial arts training into the instruction of KLA's such as Mathematics or English could be beneficial for students	1	2	3	4	5
9	If self-defence, or a martial art (of any kind) was introduced to the curriculum, I would support this.	1	2	3	4	5
10	If self-defence, or a martial art of any kind was introduced to the curriculum, I would be confident teaching this	1	2	3	4	5
11	A school-based martial arts program that addresses PDHPE syllabus outcomes is appealing	1	2	3	4	5
12	A school-based martial arts program that addresses other KLA syllabus outcomes is appealing	1	2	3	4	5

PERCEIVED BENEFITS FOR YOUR STUDENTS						
Statement: *Martial arts training can...*		Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
Physical benefits						
1	help increase energy levels in children and adolescents	1	2	3	4	5
2	improve aerobic fitness in children and adolescents	1	2	3	4	5
3	improve muscular fitness in children and adolescents	1	2	3	4	5
Wellbeing						
	improve mental health in children and adolescents	1	2	3	4	5
5	improve motivation to exercise in children and adolescents	1	2	3	4	5
6	help children and adolescents feel like they can persevere and accomplish more	1	2	3	4	5
7	help children and adolescents feel more motivated at school	1	2	3	4	5
8	decrease feelings of stress and tension for children and adolescents	1	2	3	4	5
9	help children and adolescents get along better with other people in their life (e.g. family, class mates, friends)	1	2	3	4	5
10	can address violent / anti-social behaviour in schools	1	2	3	4	5

Enjoyment						
Statements		Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
1	I believe children and/or adolescents in the class(es) I teach would enjoy participating in martial arts training	1	2	3	4	5
2	I believe children and adolescents in general would enjoy participating in martial arts training	1	2	3	4	5
3	I would enjoy teaching martial arts to students	1	2	3	4	5

Future Plans						
	Statements	**Strongly Disagree**	**Disagree**	**Unsure**	**Agree**	**Strongly Agree**
1	In the future, I would be interested in learning how to incorporate martial arts in a classroom setting	1	2	3	4	5
2	I would be interested in attending professional development / accreditation to learn how to teach basic martial arts techniques to my students	1	2	3	4	5
3	In future, I would be interested in a martial arts-based program that also improved NSW KLA Syllabus outcomes	1	2	3	4	5
4	If martial arts was introduced into the NSW curriculum, I would outsource the instruction, rather than teach it myself	1	2	3	4	5
5	In the future I would be comfortable incorporating martial arts in my own classroom	1	2	3	4	5
6	In the future I plan on participating / training (or continuing) in some form of martial art (e.g. Boxing, Kickboxing, Wrestling, Jujitsu, Karate, Taekwon-Do etc)	1	2	3	4	5

MARTIAL ARTS TOPICS MOST BENEFICIAL FOR SCHOOL STUDENTS						
	Statements	**Strongly Disagree**	**Disagree**	**Unsure**	**Agree**	**Strongly Agree**
1	**Movement / Parkour** type activities - e.g. rolling, jumping, vaulting, falling safely)	1	2	3	4	5
2	Learning how to **Dodge and Block attacks**	1	2	3	4	5
3	Learning how to **Punch**	1	2	3	4	5
4	Learning how to **Kick**	1	2	3	4	5
5	**Grappling / Wrestling** e.g. how to safely escape if tackled or grabbed	1	2	3	4	5

6	**Teamwork / team building** activities among classmates	1	2	3	4	5
7	**Wellbeing / ethical discussions** at the end of each session, focussing on topics such as Respect, Integrity, self-control etc.	1	2	3	4	5
8	**Olympic martial arts** Judo, Taekwon-Do & Karate	1	2	3	4	5
9	Learning **Katas / Forms / Poomsae** (set movement routines)	1	2	3	4	5
10	**Meditation / mindfulness**	1	2	3	4	5
11	Learning how to use various traditional **weapons** e.g. Swords, Bo Staff, Kali Sticks	1	2	3	4	5
	Concerns & suggestions					
	The main concerns I have with the inclusion of martial arts in my school are (if any):	....				
	My suggestions for increasing the implementation of martial arts in schools (if any):	....				

Appendix 12: Martial arts in schools questionnaire information statements and consent forms

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Research Project: Kick-Smart

Document Version 1 (29/06/2020)

PRINICIPAL INFORMATION STATEMENT

Dear Principal,

You are invited to participate in the research project identified above which is being conducted by *Mr Louis Burt (Doctoral Researcher)* under the supervision of *Dr Narelle Eather, Dr Nicholas Riley* and *Dr Robert Parkes* from the University of Newcastle. As a PhD candidate, Mr Burt will be supervised and supported by Dr Eather, Dr Parkes, and Dr Riley throughout the project.

Why is this research being done?

Previous studies have demonstrated the potential of integrating physical activity into mathematics lessons to increase students' activity levels and improve students' on-task behaviour, without sacrificing academic performance. Other studies have shown that martial arts programs have had positive effects on children's aggression levels, self-esteem and social behaviour.

Kick-Smart has the potential to change school policy and practice in relation to physical activity and martial arts integration, increase students' school-time physical activity levels and enhance a range of key educational outcomes. Additionally there is a growing body of literature linking physical activity with improvements in brain function and cognition. As such, the Kick-Smart study will examine the impact of the program on key measures of executive functioning: sustained attention, working memory and visual memory. Additionally, the study will examine the impact of the program on the recollection of basic numeracy facts, and physical fitness.

Who can participate in this research?

Any NSW teacher or pre-service (currently studying an undergraduate degree in education) teacher.

What choice do participants have?

Participation in this research is entirely your choice and only schools where both the principals and teachers have agreed to participate will be included in this study.
If you do agree for your school to participate, you may withdraw from the study at any time without giving a reason. A decision not to participate or discontinuation of involvement in the study will not jeopardise your relationship with the University of Newcastle.

What is involved in this study?

This study involves a single questionnaire, which will take approximately ten (10) minutes to complete.

What are the Primary Outcomes?

The primary outcomes for this study will be to understand the views of current and pre-service (currently studying an undergraduate degree in education) NSW teachers views and beliefs regarding martial arts and the inclusion of martial arts in school settings.

How will the information collected be used?

The data collected from the Kick-Smart program will be used for Mr Louis Burt's PhD thesis, journal publications and conference presentations and to inform future practice for the design of valuable, evidence-based education and health-related fitness programs. A summary of the research findings can be provided by the end of the program.

The participants can be provided (upon request) with a summary of the research findings via email by the end of the program (December 2020).

How will privacy be protected?

Any personal information provided by teachers/students will be confidential to the researchers. The results of the study will be published in general terms and will not allow the identification of individual teachers or schools. Once the data has been collected, it will be de-identified using participant codes and transcribed into an electronic data file, interview data collection sheets will be destroyed. Data will be stored for a minimum of 5 years on password protected files (only accessible to researches).

What do you need to do to participate?

Upon receipt of your consent form via email, a member of the research team will contact you to organise a time to visit the school.

Further information

If you would like further information, please do not hesitate to contact Dr. Nick Riley. Thank you for considering this invitation.

Dr Narelle Eather

Dr Narelle Eather

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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 Services, NIER Precinct, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 4921 6333, email Human-Ethics@newcastle.edu.au.

This project has been approved by the University's Ethics committee, Approval number [………………….].

Principal Consent Form

Dr Narelle Eather

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Consent Form for the Research Project:

Kick-Smart

Dr Nicholas Riley, Dr Narelle Eather, Dr Robert Parkes, Mr Louis Burt

Document Version 1 (29/06/2020)

I have been given information about the project identified above. I understand that if I consent to my school's participation in this project, I will participate in the study entitled: Kick-Smart.

I understand that I will participate in the completion of the questionnaire in Term 3, 2020.

I understand that the data collected from this questionnaire will be used for Mr Louis Burt's PhD thesis, journal publications and conference presentations, and to inform future practice for the design of valuable, evidence-based education and health-related fitness programs.

I have had an opportunity to ask the research team questions about the research and have them answered to my satisfaction.

I understand that my school's participation in this research is voluntary and that I am free to withdraw from the research project at any time. My refusal to participate or withdrawal of consent will not affect my relationship with the University of Newcastle.

By returning the below form, completed, via email, I am indicating my consent for my school to participate in this research project conducted by Dr Narelle Eather.

Name of school: ____

Principal's name: ______________________________ Mobile: ____________________

Date: ______________

Principal's signature: ______________________________

PLEASE EMAIL COMPLETED SHEET BACK TO Dr Narelle Eather

narelle.eather@newcastle.edu.au

Dr Narelle Eather

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Research Project: Kick-Smart

Document Version 1 (29/06/2020)

TEACHER INFORMATION STATEMENT

Dear Teacher,

You are invited to participate in the research project identified above which is being conducted by *Mr Louis Burt (Doctoral Researcher)* under the supervision of *Dr Narelle Eather, Dr Nicholas Riley* and *Dr Robert Parkes* from the University of Newcastle. As a PhD candidate, Mr Burt will be supervised and supported by Dr Eather, Dr Parkes, and Dr Riley throughout the project.

Why is this research being done?

This research is taking place in order to understand the views of current and pre-service (currently studying an undergraduate degree in education) NSW teachers' views and beliefs regarding martial arts and the inclusion of martial arts in school settings.

Who can participate in this research?

Any NSW teacher or pre-service (currently studying an undergraduate degree in education) teacher.

What choice do participants have?

Participation in this research is entirely your choice. If you do agree to participate, you may withdraw from the study at any time without giving a reason. A decision not to participate or discontinuation of involvement in the study will not jeopardise any relationship you may have with the University of Newcastle.

What is involved in this study?

This study involves a single questionnaire [insert link to online questionnaire here], which will take approximately ten (10) minutes to complete.

What are the Primary Outcomes?

The primary outcomes for this study will be to understand the views of current and pre-service (currently studying an undergraduate degree in education) NSW teachers views and beliefs regarding martial arts and the inclusion of martial arts in school settings.

How will the information collected be used?

The data collected from the Kick-Smart program will be used for Mr Louis Burt's PhD thesis, journal publications and conference presentations and to inform future practice for the design of valuable, evidence-based education and health-related fitness programs. A summary of the research findings can be provided by the end of the program.

The participants can be provided (upon request) with a summary of the research findings via email by the end of the program (December 2020).

How will privacy be protected?

Any personal information provided by teachers/students will be confidential to the researchers. The results of the study will be published in general terms and will not allow the identification of individual teachers or schools. Once the data has been collected, it will be de-identified using participant codes and transcribed into an electronic data file, interview data collection sheets will be destroyed. Data will be stored for a minimum of 5 years on password protected files (only accessible to researches).

What do you need to do to participate?

Upon receipt of your consent form via email, a member of the research team will contact you to organise a time to visit the school.

Further information

If you would like further information, please do not hesitate to contact Dr. Nick Riley. Thank you for considering this invitation.

Dr Narelle Eather

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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 Services, NIER Precinct, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 4921 6333, email Human-Ethics@newcastle.edu.au.

This project has been approved by the University's Ethics committee, Approval number [……………..].

Teacher Consent Form

Dr Narelle Eather

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Consent Form for the Research Project:

Kick-Smart

Dr Nicholas Riley, Dr Narelle Eather, Dr Robert Parkes, Mr Louis Burt

Document Version 1 (29/06/2020)

I have been given information about the project identified above

I understand that I will participate in the completion of the questionnaire in Term 3, 2020.

I understand that the data collected from this questionnaire will be used for Mr Louis Burt's PhD thesis, journal publications and conference presentations, and to inform future practice for the design of valuable, evidence-based education and health-related fitness programs.

By returning the below form, completed, via email, I am indicating my consent to participate in this research project conducted by Dr Narelle Eather.

Name of school: ______________________________

Teacher's name: ______________________________

Date: ____________

Teacher's signature: ______________________________

PLEASE EMAIL COMPLETED SHEET BACK TO Dr Narelle Eather

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Appendix 13: Social media advertisement text for questionnaire

Calling ALL CURRENT PRIMARY TEACHERS AND HIGH SCHOOL (PDHPE) TEACHERS and students studying to become primary, or high school PDHPE teachers.

We would love you to consider contributing to our research study investigating the use of Martial Arts in Schools. If you agree to participate you will be asked to complete a short 10min survey.
The survey aims to gather the views and beliefs of current and pre-service teachers regarding:

a) Martial arts in general;
b) The inclusion of martial arts in school settings

If, after reading the attached information statement, you are willing to complete the short survey please follow the following link:

https://prepan.au1.qualtrics.com/jfe/form/SV_87YlGyWWzD2c94V

Thank you for considering this invitation!

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