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Abstract

Purpose: Few efficacious child obesity interventions have been converted into ongoing community programs in the after school setting. The aim of this study was to evaluate the impact of phase 2 of *Back to Basics* cooking club at a low income school with a relatively high indigenous population of >10% on dietary behaviours and fruit and vegetable variety in a population at risk of obesity.

Methods: Baseline and 3-month dietary intake and Social Cognitive Theory (SCT) constructs were collected in children mean age 9 years, 61% female. McNemar tests were used for comparison of proportions between categorical variables. Cohen's *d* was used to compare effect sizes across different measures.

Results: Consumption of one or more fruit servings/day significantly increased from 41% to 67% ($P=0.02$, $d=0.13$) and the proportion of individuals consuming takeaway food less than once per week also increased. The SCT constructs assessed within the current study improved significantly ($P<0.01$), with moderate to large effect sizes ($d=0.33-0.78$).

Conclusion: This study documents that a previous efficacious healthy lifestyle program can be adapted for use as an obesity prevention program addressing improvements in vegetable and fruit intakes in a low income community with a relatively high indigenous population.

Keywords: obesity prevention, nutrition, low socioeconomic

Background

Increasing research attention is being focused on the translation of results from health promotion efficacy trials into sustainable programs and current practice (1, 2). Very few studies exist in this area and the time lag to implementation of findings from academic/clinical settings to community settings, averages 17 years (3, 4). Effective dissemination of

evidence-based programs is a process that does not happen instantaneously but rather occurs in stages that are dependent of issues such as strategic planning, funding, workforce development, ongoing training, organisational values and policy (5).

Therefore, it is not surprising that few efficacious child obesity interventions have been converted to ongoing community based programs in the after school setting (6). Many interventions for preventing childhood obesity have been implemented in the school setting (7) with modest environmental and behaviour changes (8, 9). A meta-analysis of these studies found no consistent changes in body composition (10). Children spend less than 50% of their awake time at school, studies are needed to address all of the daily influences on energy balance and improve living environments that support healthy eating and physical activity outside of school hours (11). This includes the after school setting where many children spend an increased number of hours each week and are picked up by parents or carers at the end of their working day.

To meet these needs Back to Basics (B2B) was developed as an after-school cooking program which incorporated the nutrition messages from the efficacious Hunter Illawarra Kids Challenge Using Parent Support (HIKCUPS) child obesity intervention program (12) (Figure 1), which has demonstrated improvements in child BMI z-scores (13, 14), dietary intake (15) and physical activity (16, 17) in both the short and long term (13, 14). HIKCUPS was a 3 armed RCT that targeted overweight children. Participants were randomised into a 10 week program that was either: a parent centred dietary modification program; a child centred physical activity program; or both programs simultaneously. After the HIKCUPS trial and consultation using focus groups with parents from a socio-economically disadvantaged area via a school community worker, the HIKCUPS program was converted to an initial pilot B2B program (18) and adapted to meet the expressed needs of families whose children attended an after-school program in a regional area of New South Wales (NSW), Australia. This was

phase one of the B2B program. Due to the difference in setting and the parental preference to use the children as the agents of change as well as parents, direct translation of HIKCUPS was not possible. However B2B uses knowledge translation whereby strategies from HIKCUPS have been adapted to optimise uptake in a new environment (19). Key dietary messages including how to choose healthier foods, improve recipes, get children to eat more fruits and vegetables were retained and are detailed elsewhere (18). This population group was specifically targeted given they are more likely to have inadequate intakes of fruit and vegetables and higher obesity rates than children from families with medium-to-high incomes (20). Pilot results (phase one) with 10 families demonstrated the program to be acceptable and feasible within this community setting (18). Phase two was to evaluate the program in a larger sample of children with simplified research outcome measures in an attempt to make it sustainable in this setting. The aim of the current study was to evaluate the impact of Phase two of the *B2B* after-school cooking club on dietary behaviours and fruit and vegetable variety in a population at risk of obesity.

Methods

Primary school aged children (5-12 years) attending a low income school with a relatively high indigenous population of >10% and their parents/guardians were recruited as a convenience sample across successive school terms (i.e. includes groups recruited across multiple school terms; four terms per calendar year) from a single disadvantaged low socioeconomic status (SES) school in the Hunter Region, NSW, Australia.

The school's location, based on post-code, gave a Socio-Economic Indexes For Areas (SEIFA) rank of four out of a possible maximum of 10, with one being the lowest and 10 being the highest income status. The SEIFA index is a generalised measure of socioeconomic

status derived from national population census data and allows for comparison across geographic areas in Australia. It includes a broad definition of relative socio-economic disadvantage in terms of people's access to material and social resources.

The school was previously identified as a NSW Priority School, which is a school that services a low SES community; as defined by the NSW Department of Education. The priority action school program provides enhanced resources and funding to close the gap and maximise education outcomes.

These additional resources included a school community worker and an indigenous liaison officer who assisted with participant recruitment. Baseline and 3 month follow-up data was collected between school term 3 (July-September), 2010 and term 4(October-December), 2011. The University of Newcastle Human Research Ethics committee and the school principal approved the study. Parental consent and child assent was obtained prior to participating in the study.

Dietary intake Data

Child dietary intake was assessed by a sub set of questions from a larger validated FFQ known as the Australian Child and Adolescent Eating Survey (ACAES). Specifically the tool was validated for use with primary school aged children (21-23). The ACAES assessed 11 specific eating behaviours including breakfast eating habits; fruit consumption, vegetables consumed with evening meal, takeaway foods, sweetened beverages; and type of milk. Each question included a range of frequency responses ranging from never to daily/weekly/monthly consumption. Due to the focus of the intervention on child fruit and vegetable intakes, questions specifically relating to these variables were collapsed into binary variables as meeting or not meeting a predefined program recommendation. For example for fruit: consuming at least one piece of fruit per day or more and for vegetables consuming

vegetables with main meal at least 5 times per week. Variety of fruit and vegetables was assessed individually using sub-scales scores of the Australian Recommended Food Score (ARFS) for children (24) where one point was awarded for each type of vegetable or fruit consumed at least weekly, with a maximum vegetables score of 20 and 12 for fruit. The information was self-reported by the children greater than 8 years on the day of data collection, as children of this age can reliably reporter intake (22), the interviewer asked the questions and recorded the child's response. For diet and other questionnaires, older children >7years completed the questionnaire independently but were allowed to ask for help if they wanted it. For children <7 years the information was collected by an interviewer from the children using the same tool.

Social Cognitive Theory (SCT) Constructs

SCT constructs were incorporated into each program session and have been previously mapped in detail (18). The sessions were grounded in 10 key constructs of SCT: environment; situation; behavioural capabilities, outcomes expectations and expectancies, self-control; observational learning; reinforcement, self-efficacy; emotional coping responses and reciprocal determinism. SCT constructs were assessed using a researcher developed questionnaire which comprised of 51 questions and took approximately 20 minutes to complete. SCT constructs of: knowledge (4 items), expectancy (9 items), self-efficacy fruit (6 items), self-efficacy vegetable (6 items), environment (7 items), self-control (9 items) and situation (6 items) were assessed. This survey was modelled on a previous questionnaire to assess self-efficacy of fruit and vegetable intake (25). A Likert scale using smiley face responses were provided for each question and labelled either 'Strongly Disagree' through to 'Strongly Agree' or 'Never', 'Rarely', 'Sometimes', 'Often' and 'Always' depending on the question for all children. Cronbach alpha statistics were used to verify internal consistency of

items in the questionnaire with results shown in Table 2b. Values of 0.70 or above are considered as demonstrating acceptable reliability (26).

Intervention

The phase one intervention is described in detail elsewhere (18) and was further modified in phase 2 based on results of the process evaluation, as well as facilitator feedback from the previous pilot study Figure 1 (18). A number of modifications were made including: (i) removal of the final social BBQ to reduce the time commitment for parents and staff; (ii) removal of the physical activity session due to lack of engagement from families; (iii) re-orientation of the major focus to children to increase cooking efficacy; and (iv) addition of nutrition information talk for parents in the final 30 minutes of the session before the child is collected. The nutrition information session comprised of a range of visual nutrition displays with discussion topics, weekly recipe and homework charts to complete about family food habits, as outlined in Table 1. Phase 2 of the B2B program involved 5 x 90minutes cooking sessions after-school (3-4:30pm), once every two weeks during one school term. Each session sequence was as follows: 1) children provided with a healthy afternoon tea (e.g. fruit and/or crackers with cheese and vegemite™ spread); 2) cooking session; 3) parent activity session and 4) the meal/food prepared by child is shared with parents. Parents and children then sat together as a group to taste and discuss the meal that the children had prepared in a relaxed and comfortable environment. Families were provided with a ‘vegetable of the week’ and recipe to encourage them to cook with vegetables at home. For example eggplant/aubergines were provided to the families to cook with that fortnight. The practical cooking sessions (~90mins) were designed specifically for children and were led by a trained member of the research team who had training with cooking classes and most often an accredited dietitian. The parents’ information sessions (~15mins) were facilitated by a member of the research team, with assistance from the school’s community liaison officer and/or indigenous support

worker. The parent education sessions (~30mins) were designed to be in an informal setting, usually next door to where the children were cooking, and with enough space to allow parents to engage with the material at their own pace, and to allow for hands on or visual/practical activities and facilitate group discussion on the topic.

Statistical Analysis

Data was analysed using Statistics Package for Social Sciences (SPSS) Statistical software version 19 to conduct descriptive analysis with Wilcoxon signed rank tests used to assess differences within groups over time. McNemar tests were used for comparison of proportions between categorical variables including those consuming fruit at least once /day or not and consuming vegetables with dinner at least 5 times per week. Cohen's d was used to compare effect sizes across different measures (27) and allows for a more direct comparison of effects on each outcome variable and for smaller samples. These were calculated using the mean difference and the pooled standard deviation of the group ($d = \frac{M_1 - M_2}{\sigma_{\text{pooled}}}$). Effect sizes were interpreted as small ($d > 0.20$), medium ($d > 0.50$) or large ($d > 0.80$) (27).

Results

A total of 51 children were recruited across the study time frame and completed the program, the average attendance rate was 90% with a mean of nine participants per session. Not all subjects completed the questionnaires and the actual numbers varies by items and is reported in Tables 2a and 2b with an average of 37 (72%) completing the majority of measures. The mean age of children was nine years (range 6-13yrs, 61% female). Five children (13.5%) identified as being of Aboriginal, Torres Strait Islander (ATSI) descent. No language barriers were identified in the group. Changes from baseline to 3 months follow up for dietary behaviours and SCT outcomes are reported in Tables 2a and 2b.

Dietary Behaviours

At baseline 41% of participants reported consuming at least one piece of fruit/day; at 3 month follow up this increased to 67% ($P=0.02$ McNemar test). At baseline, 32% of the children reported consuming vegetables with dinner at least 5 times per week; at 3 month follow up this increased to 43% , $P=0.018$ (not statistically significant) . At baseline 36% of the children reported consuming takeaway foods (e.g. Chinese, fish and chips, hamburger and chips/fries, pizza) less than or equal to once a week; at 3 month follow up this increased to 56% (Z score -1.84 , $P=0.06$). At both time points $>80\%$ of children were consuming full cream milk and 7% were reported consuming reduced fat or skim varieties of milk. Effect sizes for dietary behaviours were calculated and while some were small the majority were classified as being moderate to good (range $d = 0.02$ - 0.45 Tables 2a and b). While not statistically significant, the variety of both fruit and vegetables reported by children increased post program. For vegetables the baseline the median score was 7 out of a possible score of 20 (range 0-20) and at 3 month follow-up this increased to 8. For fruit the median score was 4.5 at baseline (0-11) out of a possible score of 12 and increased to 6 (0-12) at 3 month follow up.

SCT outcomes

Table 2a shows SCT constructs assessed in this study for children in the back to B2B program. All seven SCT constructs changed significantly ($P<0.01$) from baseline. Analysis using Cohen's d found moderate ($d>0.50$) to large effects for six of the seven SCT constructs assessed (Table 2a). In descending order these were for self-efficacy to consume fruit ($d=-0.78$), situation (-0.70), self-control (-0.76), self-efficacy to cook and/or consume vegetables (-0.58), expectancy (-0.55) and knowledge (-0.50) with only a small effect shown for environment (-0.33).

Discussion

The aim of the current study was to evaluate the impact of Phase two of the *B2B* after-school cooking club on dietary behaviours and fruit and vegetable variety in a population at risk of obesity. The current study provides an example of adaptation and knowledge translation of key dietary messages from an efficacious RCT to the after school environment, in an effectiveness study. The Phase two B2B program was successful at increasing the proportion of children reporting fruit consumption at least once per day, as well as increasing the weekly variety of fruit and vegetables. Changes in dietary intakes included increasing weekly fruit and vegetable variety and reducing takeaway foods. The program was developed and implemented using the theoretical framework of SCT with favourable intervention effects for six of the seven SCT constructs demonstrating moderate-to-large effect sizes.

While there was a reported increase in the vegetable variety, these were not statistically significant this is likely due to the small sample size and lack of statistical power. It is acknowledged that the effect sizes and impact on behavioural outcome measures will always be smaller when research programs move from efficacy to effectiveness to public health interventions.

Parents were engaged in the intervention and while they were not the sole agents of change, as in the original HIKCUPS program, the current study fostered change in child self-efficacy for fruit and vegetable preparation and consumption. . Efficacy studies are usually conducted under well-resourced for ideal ‘laboratory’ or controlled condition. This means they are not able to be implemented in the same way when trying to translate the results to community programs. Hence, the B2B program was adapted from the original HIKCUPS trial for this reason (19). In addition, the change in format between phase one and two reduced the amount of time parents were involved, switching the focus from parents to both the child and the parents as dual agents of change. The reduction in parent time commitment was based on parental feedback from phase one. The parent education sessions focused on topics that

aligned with those previously identified for low income families (28) including messages on role modelling and cooking and eating together. The retention in the program was high (n=51) with no dropouts, however only three quarters of participants dedicated time to complete the surveys which may reflect the loss of research integrity when adapting research to community setting.

Limitations include that one school was used for recruitment, the sample size is small and a control group was not feasible. A further limitation is that in order to accommodate the after school setting and the time constraints, the questions for both diet and SCT were taken from previously validated tools, but the subset used was not validated. Hence results should be interpreted with caution. Complete dietary intake was not assessed as part of this study so it cannot be concluded that substantial diet improvements were achieved, however overall increases in diet quality in children has been associated with better growth profiles (29). In addition the goal of the program was not unknown to participants so results shown for this study may also be attributed to social desirability.

Relevance for practice: If dietary programs in Australia, Canada and internationally are to be translated to sustainable environments in indigenous groups in the after school setting, documentation of the process will be of value to practitioners and researchers. The BTB program was about targeting minority indigenous groups who are of greater risk of obesity related ill health. The current study, phase two of B2B, was very different from phase one in which the program was developed based on what the population group “thought” they wanted in terms of content, whereas the current study presents the revised program based on the feedback and learnings from phase one. Reliability values (cronbach alphas) for SCT constructs were low for the domain of knowledge. This may be a true effect size, or partly attributed to the small sample size. Further research with a larger sample size is warranted. In addition strategies to increase knowledge could be strengthened when the program is revised.

As part of adapting research programs both dietetic practitioners and researchers need to allow adequate time to consult with the relevant stakeholders, conduct needs assessments and to contextualise program components to the community needs. Further this may need to be done over a number of program iterations. Key challenges in translational research include the stop and start nature of the program (i.e. lack of continuum), varying personnel being involved in the community program, across sites and subsequent school terms.

Future studies should ensure adequate descriptions of interventions and mapping of successful components from efficacy trials to program components as first steps in developing sustainable community based interventions.

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330 Table 1. Session Outline of the Back to Basics Cooking Club

Session	Children's Cooking Component	Parents Information Session Topic	Parent Engagement
Session 1 <i>Assessment 1</i>	Food Hygiene Safety in the kitchen Crunchy Crostoni's	Why food? Benefits of eating fruits and vegetables?	Health benefits of fruits and vegetables. Visual display of fresh fruit & veg.
Session 2	Fruit Salad and smoothie	Getting the balance right- How much food should my child eat?	Visual display showing a day of healthy food for a typical child.
Session 3	English muffin Pizza's	Family food habits	Reading food Labels Categorise foods according to fat/ energy
Session 4	Bush Beef Stir Fry	Goal setting/ monitoring	Setting a personal and family goal
Session 5	Apple Berry crumble	Congratulations- Evaluation and feedback	

Assessment 2		

Table 2a: Changes in Social Cognitive Theory Constructs (SCT) for children participating in the Back to Basics Program

SCT Construct (n)	Mean $\pm$ SD	Mean $\pm$ SD	Z	P value	Effect size Cohen's d^a	Cronbach α
	Baseline	Follow up				
Knowledge (n= 33)	1.48 $\pm$ 0.47	1.67 $\pm$ 0.28	-2.31	0.02	-0.50	0.57
Self-efficacy (fruit) (n= 36)	4.06 $\pm$ 0.84	4.57 $\pm$ 0.38	-3.63	<0.001	-0.78	0.80
Self-efficacy Vegetables (n= 35)	3.82 $\pm$ 0.93	4.26 $\pm$ 0.56	-2.61	0.009	-0.58	0.86
Environment (n= 35)	3.69 $\pm$ 0.69	3.94 $\pm$ 0.78	-2.01	0.045	-0.33	0.72
Self-control (n= 35)	2.91 $\pm$ 0.82	3.51 $\pm$ 0.75	-3.44	0.001	-0.76	0.80
Situation (n= 35)	4.24 $\pm$ 0.54	4.59 $\pm$ 0.45	-3.00	0.003	-0.70	0.70
Expectancy (n= 35)	4.51 $\pm$ 0.53	4.77 $\pm$ 0.41	-3.22	0.001	-0.55	0.79

Z statistic analysed with Wilcoxon signed rank test, ^a Small effect size Cohen's d

=0.2, moderate effect size = 0.50, large effect =0.80

Table 2b: Changes in dietary behaviours as assessed by The Australian Eating Survey for children in the Back to Basics program

Dietary behaviour	Mean $\pm$ SD	Mean $\pm$ SD	Z	P value	Effect size Cohen's d^a
	Baseline	Follow up			
Pieces of fruit / day (n=45)	5.47 $\pm$ 1.63	5.69 $\pm$ 1.65	-1.17	0.24	-0.13
Vegetables consumed with evening meal (n=45)	3.91 $\pm$ 0.97	4.11 $\pm$ 1.0	-1.38	0.17	-0.20
Takeaway consumption (n= 40)	2.98 $\pm$ 1.23	2.50 $\pm$ 0.88	-1.84	0.07	0.45
Consume evening meal in front of the TV (n=39)	3.87 $\pm$ 1.96	3.41 $\pm$ 1.92	-1.57	0.12	0.23
Time spent watching TV (n= 39)	1.95 $\pm$ 0.86	1.97 $\pm$ 0.81	-0.29	0.76	-0.02
Weekly pocket money (n= 39)	2.05 $\pm$ 1.30	2.15 $\pm$ 1.48	-0.005	0.96	-0.07
Consumption of snacks (n= 37)	2.51 $\pm$ 0.84	2.81 $\pm$ 0.94	-1.85	0.06	-0.33
Glasses of sweetened drinks (n= 37)	2.11 $\pm$ 1.13	1.95 $\pm$ 0.94	-1.07	0.28	0.15
Type of milk (n= 37)	3.48 $\pm$ 1.15	3.53 $\pm$ 1.22	-0.21	0.83	-0.04

Z statistic analysed with Wilcoxon signed rank test, ^a Small effect size Cohen's d

=0.2, moderate effect size = 0.50, large effect =0.80

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