Impacting Dietary Behaviors of Children from Low Income Communities: An Evaluation of a Theory-Based Nutrition Education Program

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Abstract

The purpose of this study was to evaluate an expanded version of the Food Fit program, a Social Cognitive Theory based (SCT) nutrition intervention, among children in a low-income community. Eighty-five children ages 8 to 13 (mean=9.15 years; SD=1.05) were enrolled in this study. Impact and outcome measures included BMI percentile and dietary behaviors, which were evaluated before and after the program, and after a three-month follow up period. In addition, constructs of social cognitive theory, including behavioral capabilities (BC), self efficacy (SE), and outcome expectancies (OE), were evaluated before and after each lesson. Results indicated statistically significant improvements for BC's in 11 of the 14 lessons (p=0.001), but changes in SE's and OE's did not reach levels of significance. There was also a significant improvement in overall dietary behaviors (p=0.036), and an increase in BMI percentile for normal weight children only (p=0.001). Compared with the previous implementation of Food Fit with children from middle-income families, this group had a similar level of changes for knowledge and skills, but fewer self-reported changes in confidence and desire to use the knowledge and skills discussed during the program. Reasons for these differences necessitate further investigation.

Keywords: Social Cognitive Theory, childhood obesity, low income families

Introduction

Childhood obesity has tripled in the past thirty years, and currently 31.8% of children (2-19) are either overweight or obese, and 16.9% are obese (Ogden, Carroll, Kit, & Flegal, 2012). This is of concern since obesity has been associated with numerous medical issues including type-2 diabetes, sleep apnea, hypertension, dyslipidemia, and metabolic syndrome (Daniels, et al., 2005). Annual health care expenditures due to obesity related diseases have also increased and have been estimated to be $11 to 14 billion for children and youth and $75–93 billion for adults (Bell, Zimmerman, Arterburn, & Maciejewski, 2011). Experts agree that early opportunities for health promotion are key, and could help alleviate future health disparities and health care costs associated with these problems.

Many programs have been developed to improve health behaviors among children. In a meta-analysis of 57 randomized controlled trials of childhood obesity prevention programs, 19 studies focused on improving nutrition (Thomas, 2006). Of these, six reported no significant difference between treatment and control groups, twelve reported mixed results, and only one reported statistically significant results.

Of the 57 studies reviewed in the meta-analysis (which included nutrition and/or physical activity components), four studies showed statistically significant results. One of the commonalities among these four studies was that programs were rooted either implicitly or explicitly in Social Cognitive Theory (SCT), and included behavior modification techniques to mediate changes in SCT constructs. The programs included Child and Adolescent Trial for Cardiovascular Health (CATCH), Gimme 5, Planet Health, and Sports, Play, and Active Recreation for Kids (SPARK). Limitations with programs yielding insignificant results included a lack of a theoretical basis; follow-up evaluations were rarely reported, making it unknown if changes were maintained over any period of time (Thomas, 2006).

Food Fit

Similar to previously successful programs designed for elementary aged children (third, fourth and fifth grade), Food Fit was a nutrition education program based upon the underpinning of SCT (Branscum, & Kaye, 2009). The content of the program was also designed to target dietary behaviors, such as choosing lower calorie snack foods, choosing beverages low in sugar, and eating fruits and vegetables, all of which are thought to be associated with the prevention of childhood obesity. The Food Fit program differs from other programs in that it was designed specifically for the after-school environment. For example, each of the 14 lessons were created to be stand-alone, to enable children to participate in each lesson, even if they miss previous lessons. The evaluation scheme of Food Fit was also novel in two ways. First, in order to evaluate the efficacy of the program behavioral antecedents, dietary behaviors, and Body Mass Index (BMI) percentiles were all measured. Second, behavioral antecedents of SCT (such as self-efficacy) were measured before and after each lesson, in order to evaluate the immediate effects of each lesson.

Food Fit was initially piloted in five after school programs with children in the 3rd through 5th grade. Results from this study were promising, as children reported statistically significant improvements for many SCT constructs, and overall dietary behaviors (Branscum, et al., 2009). One limitation of the initial pilot testing, however, was that the program contained six lessons, implemented over six weeks, which is considered brief for an obesity prevention intervention (Cook-Cottone, Casey, & Feeley, 2009). The program was also implemented with children in the third, fourth and fifth grade (ages 8 to 13 years), from middle-income families, which limits the generalizability of the results as they pertain to children from lower income families. More studies are needed that evaluate the feasibility and effectiveness of longer-term theory-based nutrition education programs among high-risk groups, such as children from low-income families. Therefore, the purpose of this study was to evaluate an expanded version of the Food Fit program with children in the third, fourth and fifth grade from a low-income community.

Methods

Design

Children from six YMCA-sponsored after school programs were recruited for participation in this study. To recruit children, study personnel described the nature of study to parents as they picked their children up from the after school program. Parents who were interested and willing signed a parent permission form to enroll their child in the program. Next, study personnel described the nature of study to the enrolled children. Children who were interested and willing to participate were asked to give verbal assent. All of the YMCA sites participated in the intervention for 14 weeks (14 lessons). Approval was obtained from the Ohio State University Behavioral and Social Sciences Institutional Review Board before the initiation of the study.

Intervention Description

Food Fit was designed using the theoretical underpinnings of SCT, which posits that human behavior can be explained by reciprocal determinism, or a continuous interaction between behavior, personal factors and the environment. ‘Behavior’ refers to the health behavior, which is being targeted or modified. ‘Personal factors’ refer to cognitions, affect and biological events. ‘Environment’ refers to the social and physical environments (Sharma, & Romas, 2012). A variety of behavior change techniques were implemented in each lesson to impact select SCT constructs, which in turn were theorized to impact dietary behaviors. Techniques included hands on activities to teach abstract concepts, skills development though instructor modeling and practice, positive role modeling, role-playing, positive and vicarious reinforcement, and taste-testing healthy foods (Branscum, 2008; Warner, 2009). For an example of how lesson content was planned for each lesson, please refer to Table 1.

Each lesson was developed to last between 30 to 45 minutes. Topics covered during each lesson were: Choosing lower calorie snack foods (Lesson 1), choosing one serving of a snack food (Lesson 2), choosing beverages without added sugar (Lesson 3), choosing cereals with a low amount of added sugars (Lesson 4), eating fruit and choosing whole fruit for breakfast and snacks (Lesson 5), eating vegetables and choosing raw vegetables for a snack (Lesson 6), drinking milk and choosing low fat dairy products (Lesson 7), eating breakfast everyday (Lesson 8), learning the proper serving size for fruit and 100% fruit juice (Lesson 9), learning the proper serving size for vegetables (Lesson 10), choosing low calorie entrees when eating out at restaurants (Lesson 11), choosing lower calorie side dishes when eating out at restaurants (Lesson 12), choosing 100% whole wheat breads (Lesson 13), and choosing lower calorie lunchmeats and condiments for sandwiches (Lesson 14).

Each lesson followed the same format, and consisted of five sub-sections, which included: Introduction, Benefits and Consequences, Modeling and Taste Testing, Role- Playing, and Wrap-Up. During the *Introduction,* the instructor introduced the lesson's key objectives and asked children if they were aware of the behavior. During the *Benefits and Consequences* section the children participated in activities designed to demonstrate the benefits and consequences of the targeted behavior. For example, one activity showed children the effects of eating lower and higher calorie snack foods by weighing them down with playground balls and asking them to run a lap around the gym. In the *Modeling and Taste Testing* section the instructor modeled the targeted behavior and led a taste testing activity. For example, for Lesson 6 (eating vegetables and choosing raw vegetables for a snack), the instructor showed the children raw broccoli and grape tomatoes and ate the foods in front of them, stating 'This is a great snack to have when you are hungry'. The instructor further went on to say 'Would you like to try some of these great foods with me?' The next part of the lesson was *Role-Playing* where children participated in a structured role-playing demonstration with the instructor of the lesson. In two scenarios, the instructor pretended to be either their parent or best friend, and the child was asked to teach their parent or friend the benefits of engaging in that lessons behavior. The instructor wrapped up the lesson by reviewing the main concepts of the lesson, and asked the children if they had any final questions. An example of lesson content and how content related to each SCT construct can be found on Table 1. Readers wanting more information about the Food Fit program can contact the corresponding author.

The Food Fit program was implemented and evaluated by interns enrolled in the Dietetic Internship program in the department of Nutrition at the Ohio State University. The week before each lesson, the investigators trained the interns on the proper implementation of the program, and interns were asked to practice implementing parts of the program to show that their level of competency.

Impact and Outcome Evaluation

Impact and outcome measures included constructs of SCT, self-reported dietary behaviors, and BMI percentile. To evaluate constructs of social cognitive theory, a pre and posttest survey was administered at each lesson. Dietary behaviors and BMI percentile were evaluated before and after the intervention, and after a 3-month follow-up period.

Behavioral Capabilities

Behavioral capabilities (BC) were evaluated using skills and knowledge based items. On average there were three to six items for each lesson. An example of an item measuring BC's for the first lesson was asking children to report the number of calories that were in three types of snack foods. For scoring BC items, one point was given for each correct response and no points were given for an incorrect response.

Self-Efficacy and Outcome Expectancies

To evaluate self-efficacy (SE) and outcome expectancies (OE), survey items used a root that was followed by a statement describing a skill or behavior targeted during the lesson. For SE items, the root 'I am sure I can' was used, and for the OE items the root, 'I want to' was used. An example of an item measuring SE for the

Table 1

Outline of a Typical Lesson of the Food Fit Program

Module	**Purpose of Module**	**Constructs Targeted**
Introduction & Purpose of Lesson	Topic: Introduction to Lesson's Key Objectives Example: Lesson 1 -Introduce Yourself to Audience -Define Key Terms (Food Label; Snack Food; Calories) and Skills (Identifying and Reading Calories on Food Label) -Define Purpose of Lesson (Choosing Lower Calorie Snack Foods)	BC's
Benefits and Consequences	Topic: Explain & Conduct Hands on Activity Example: Lesson 1 -Identify Where Calories Come From (Foods and Drinks) -Identify How Bodies Use Calories (Bodies use energy and store away extra energy) -Identify 'Choosing Lower Calorie Snack Foods' as a Strategy for Healthy Eating	OE's
Modeling and Taste Testing	Topic: Model Food Selection Behaviors and Taste Testing Example: Lesson 1 -Compare and Read Food Labels for Different Snack Foods by Breaking Task into Small Subtasks -Choose Lower Calorie Snack Food (Pretzels instead of potato chip) -Taste Test Healthier Food Choice (Pretzels instead of potato chip)	SE's
Role-play Simulations	Topic: Role-Play using a Parent and Peer Simulation Example: Lesson 1 -Practice Choosing Lower Calorie Snack Foods w/Role Play -Role Play #1: With a Peer -Role Play #2: With a Parent	SE's & OE's
Wrap up and Goal Setting	Topic: Review Lesson's Key Objectives Example: Lesson 1 -Review Key Terms/Skills Covered During Lesson -Goal Setting Activity (Choose lower calorie snack foods) -Question & Answer Session	BC's, SE's & OE's

Abbreviations: Behavioral Capabilities (BC); Self-Efficacy (SE); Outcome Expectancies (OE)

first lesson was "I am sure I can read Calories on food labels on my own". An example of an item measuring OE for the first lesson was "I want to read the food label to choose lower Calorie snack foods". Children responded to these items using a three point Likert type scale (agree, neutral, disagree). Composite scores were used to evaluate the constructs, and on average there were three items per construct. For each item two points were given for the response 'Agree', one point was given for the response 'Neutral' and no points were given for the response 'Disagree'.

Dietary Behaviors

A child-modified version of the Food Behavior Checklist (CM-FBC) was administered to evaluate children's self-reported dietary behaviors (Townsend, Kaiser, Allen, Joy, & Murphy, 2003). The CM-FBC contained 19-items, and measured behaviors such as fruit and vegetables consumption, healthy snacking and milk consumption. Responses were either dichotomous (Yes/No), or on a five point Likert type scale (0 Servings – 5 Servings). For dichotomous responses a score of one was given for the healthy behavior and a zero was given for the less healthy behavior. The scores for each question were summated to create a composite score, with lower scores indicating a 'less healthy' diet and higher scores indicating a 'healthier diet'.

Body Mass Index Percentiles

Height was measured with a portable stadiometer (Seca 214) to the nearest 0.1 cm and weight was measured on an electronic digital scale (Tanita HD 317) to the nearest 0.1 kg. To minimize bias from incorrect scale readings, the electronic scale was zeroed periodically throughout the study, according to the manufacturer's specifications. Body mass index (BMI) percentiles were calculated using the BMI calculator available from the Centers for Disease Control and Prevention (CDC, 2013). Necessary inputs for computing BMI percentile were date of birth, date of measurement, gender, height and weight. Interpretation of BMI percentile included the following: ≥95th percentile (obese), 85th to 95th percentile (overweight), 85th to 5th percentile (normal weight), and ≤5th percentile (underweight).

Data Analysis

A paired t-test was used to evaluate differences between pre and posttest scores for each SCT constructs in each lesson. For each lesson three t-tests, one for each construct, were conducted. To compensate for the large number of analyses, the Bonferroni's adjustment was utilized, which reduced the alpha level of significance to 0.017 (0.05 divided by 3). Changes in responses to items on the CM-FBC between pre, post and follow up were examined using a repeated measures ANOVA. Changes in height, weight and BMI percentile between pre, post and follow up were also examined using repeated measures ANOVAs (one for each outcome). The statistical software used for data analyses in this study was SPSS Statistics version 17 (SPSS Inc. Chicago, IL). To evaluate effect size, Cohen's f were calculated as described in Kirk (1995), and interpreted as small (f=0.10), medium (f=0.25), and large (f=0.40).

Results

Eighty-five children were enrolled in the study. There were more male (n=51) than female (n=34) children; ages ranged from 8 to 13 years, with an average age of 9.15 years (SD=1.05). The self-reported ethnicities of the children included Caucasian (47.2%), African American (45.4%), Hispanic (5.6%), and Other (1.5%). At the time of pretest, 2.4% of children were underweight, 54.1% were normal weight, 15.3% were overweight, and were 28.2% obese. Almost half of the subjects (43.5%) were either overweight or obese, and seven children (8%) were higher than the 99th percentile.

Per Lesson Evaluation

On average 47 children participated in each lesson, and the children as a group attended a mean of 6.7 sessions. There were significant improvements for BC's in 11 of the 14 lessons, including: Choosing lower calorie snack foods (p=0.012), choosing one serving of a snack food (p=0.001), choosing beverages without added sugars (p=0.003), choosing cereals with a low amount of added sugars (p=0.014), eating fruit and choosing whole fruit for breakfast and snacks (p=0.001), eating vegetables and choosing raw vegetables for a snack (p=0.001), drinking milk and choosing low-fat varieties (p=0.001), eating breakfast everyday (p=0.001), proper serving size for fruit and fruit juice (p=0.001), proper serving size for vegetables (p=0.001), choosing 100% whole wheat bread (p=0.001). There were also significant improvements in SE in two lessons, including: choosing lower calorie snack foods (p=0.01) and choosing one serving of a snack food (p=0.008). Finally, there were no lessons that had a significant improvement for OE's. See Table 2 for the complete list of mean scores and standard deviations for each construct per lesson.

Dietary Assessment and Changes in Body Mass Index Percentiles

Eighty-four children completed the CM-FBC at pretest, 61 children completed it at the time of posttest, and 48 children completed the survey for all three time points (pretest, posttest and 3-month follow-up). A significant main effect was found for the CM-FBC scores, indicating an improvement in overall dietary behaviors. Post hoc analyses indicated that CM-FBC scores increased between baseline and posttest, but no change was found at follow-up. The effect size for this measure was small (f=0.16).

Table 2

Pre to Post Changes in Composite Scores for Social Cognitive Theory Constructs

Lesson/Description	n	Behavioral Capabilities Possible Range	BC PRE	BC POST	Self Efficacy Possible Range	SE PRE	SE POST	Outcome Expectancies Possible Range	OE PRE	OE POST
Lesson 1: Healthy Snacking	44	0-5	2.70	3.48*	0-6	5.11	5.48*	0-4	3.09	3.20
Lesson 2: Healthy Snacking	44	0-3	1.39	2.25**	0-8	6.23	7.07*	0-6	4.82	5.18
Lesson 3: Reducing Sugar Intake	48	0-6	4.67	5.15**	0-4	3.40	3.69	0-6	4.71	4.94
Lesson 4: Reducing Sugar Intake	46	0-5	3.61	4.26*	0-4	3.24	3.69	0-6	4.76	4.78
Lesson 5: Consuming Fruits/Veggies	54	0-4	2.07	2.83**	0-8	6.52	6.65	0-8	6.59	6.61
Lesson 6: Consuming Fruits/Veggies	51	0-3	1.61	2.06**	0-6	4.65	4.39	0-6	4.59	4.37
Lesson 7: Consuming Milk/Dairy	50	0-5	2.62	3.24**	0-10	7.88	8.02	0-10	7.96	7.86
Lesson 8: Consuming Breakfast	60	0-3	1.50	2.02**	0-8	7.00	7.17	0-8	6.90	6.88
Lesson 9: Consuming Fruits/Veggies	49	0-4	2.00	3.04**	0-8	6.80	7.06	0-8	6.73	6.92
Lesson 10: Consuming Fruits/Veggies	52	0-4	2.44	2.96**	0-8	6.27	6.52	0-8	6.04	6.40
Lesson 11: Eating at Restaurants	46	0-4	3.00	3.33**	0-6	5.22	5.46	0-6	4.98	5.24
Lesson 12: Eating at Restaurants	34	0-4	3.76	3.82	0-6	5.26	5.41	0-6	4.94	5.00
Lesson 13: Consuming Whole Grains	45	0-3	1.73	2.42**	0-6	5.16	5.07	0-6	4.69	5.11
Lesson 14: Healthy Condiments	35	0-6	5.03	5.06	0-8	6.77	7.00	0-8	6.31	6.83

**p* = .01. ***p* = .001.
Abbreviations: Behavioral Capabilities (BC); Self-Efficacy (SE); Outcome Expectancies (OE)

Table 3

Changes in Diet, Height, Weight and BMI percentile For Children Enrolled in Food Fit

Variable	n	Pretest M(SD)	Posttest M(SD)	Follow-up M(SD)	p-value	Effect Size (Cohen's *f*)
Height	49	138.10 (8.46)[1,2]	140.49 (8.91)[1,3]	141.53 (8.95)[2,3]	0.001	1.15
Weight	49	40.71 (14.95)[1,2]	43.85 (16.28)[1,3]	44.75 (16.79)[2,3]	0.001	0.83
BMI percentile	49	71.54 (29.54)[1,2]	74.09 (27.25)[1,3]	79.02 (24.79)[2,3]	0.001	0.47
FBC Total Score	48	7.60 (2.21)[1]	8.52 (2.39)[1]	8.15 (2.48)	0.036	0.16

Abbreviations: BMI (body mass index)
*significant for main effect over time
Numbers (i.e. 1 and 2) represent significant post hoc pair wise comparisons

For measuring height and weight, 85 children were measured at pretest, 62 children were measured at posttest, and 49 children were measured for all three time points (pretest, posttest and 3-month follow-up). From pretest to posttest, one child moved from being classified as underweight to normal weight, two children moved from being classified as normal weight to overweight, and one child moved from being classified as overweight to normal weight. From pretest to the 3-month follow up, three children moved from being classified as normal weight to overweight, one child moved from being classified as normal weight to obese, and two children moved from being classified as overweight to normal weight. A statistically significant main effect was found for height, weight and BMI percentile, indicating a significant increase for all three measures. Post hoc analyses indicated that height, weight, and BMI percentile all increased between baseline and posttest, baseline and follow-up, and from posttest to follow-up. Subsequent ANCOVA's were conducted to determine whether changes over time varied according to important covariates, such as age, gender and ethnicity, however no covariates were found to have a significant effect.

Additionally, research participants were stratified into two groups based on obesity status, normal weight (n=22) and overweight/obese (n=26), and repeated measures ANOVAs were conducted to investigate whether the increase in BMI percentile was a pattern for all children. Both normal weight children (p=0.001) and overweight/obese children (p=0.001) experienced a significant increase in BMI percentile from pretest to the 3-month follow up, however only normal weight children experienced a significant increase from pretest to post test, indicating that the program may have been protective for overweight and obese children while they were enrolled. Effect sizes were generally large for these measures (f=0.47 to 1.15). See Table 3 for the complete list of mean scores and standard deviations for height, weight, BMI percentile and the composite CM-FBC score.

Discussion

The purpose of this study was to evaluate an expanded version of the Food Fit program, a Social Cognitive Theory based (SCT) intervention among children in a low-income community. Results from this study suggest that the Food Fit program was effective in positively affecting children's BC's for a majority of the nutritional behaviors targeted during the intervention. According to Bandura's Social Cognitive Theory, repeated exposure to modeling stimuli "produce[s] enduring, retrievable images of modeled performances" (Bandura, 1998). Food Fit focused on repeatedly modeling behaviors that we intended children would learn and practice in their daily lives, such as reading food labels before making food selections. During each lesson the Food Fit instructor asked every child present to demonstrate the skill or behavior targeted during the lesson. Children are more likely to remember a behavior if they actually rehearse or model the behavior than those who only visually observe the model and do not rehearse the behavior (Bandura, 1998).

In this study children's perceived SE about choosing lower calorie snack foods and choosing one serving of a snack food significantly increased, however SE for the remaining lessons did not. This finding differed from what was reported in the initial pilot test of Food Fit, where there was an increase in SE for a majority of the lessons. This may be attributable to the difference in the populations in both studies. The pilot test took place in middle-income areas, while this study focused on low-income areas, where a majority of the children were enrolled in the free or reduced school lunch program. In Columbus, OH, 41% of children live in the 100-200% poverty range are overweight (Osteopathic Heritage Foundations & Children's Hunger Alliance, n.d.). Cultures of low-income populations often experience a sense of powerlessness in changing one's situation while higher incomes can reinforce a people's sense of mastery and self-efficacy (Mirowsky, & Ross, 2002). Since this study was conducted in lower income areas of Columbus, OH it is feasible that these children may not have felt like they had control to change their own eating behaviors and in turn, they may not have much SE in their ability to do so.

Social Cognitive Theory posits that within any social group there are individuals who are more likely to be respected and valued, and that modeling by these individuals is more effective than modeling by people of lower status (Bandura, 1977). Furthermore, a variety of models can be more effective than using one model (Bandura, 1977). Food Fit generally had one model at each lesson, and usually, the dietetic intern implementing the program was a white, young adult, female. This differed in the initial pilot testing of Food Fit, where both genders were represented as models and the racial diversity of the instructors was fairly high. Having a wider variety of models may have helped the children believe they could perform the behaviors being taught in the initial implementation of Food Fit. It is recommended that if this program is implemented in the future, more appropriate models should be used.

In this study OE did not appear to change for any lesson. One possible reason for this finding was that the root ‘I want to’ has not been validated as a way to evaluate OE’s. During the planning stages of Food Fit, the rationale for using the ‘I want to’ root was that if a person expects a behavior to produce a certain result, and they value that result, then they will likely *want* to engage in the behavior. However, OE by definition is value a person places on an expected outcome. Instead of measuring OE, it is possible that the instrument was measuring behavioral intentions, which are partially influenced by OE’s, but not entirely. The OE items also did not always focus on an expected outcome. For example, one item read ‘I want to choose lower calorie snack foods when I eat.’ The question does not state what the outcome of this behavior might be and whether or not the respondent values the outcome. This may have lead to measurement failure, which limits out ability to make any conclusion about how Food Fit changed children’s OE.

One of the primary purposes of this study was to evaluate the effect participating in Food Fit had on constructs of SCT. Ideally, these constructs should act as mediating variables and subsequently affect the targeted behavior. Changes in dietary behaviors were measured by the CM-FBC. There was a significant positive increase in CM-FBC score from pre to post test, and it appeared this increase was sustained after the three month follow-up period. While this was an encouraging result, it does not quite match our results from the SCT constructs. It may be the case that all children needed was an increase in their BC’s to improve their dietary behaviors. In fact, according to Fishbein and Ajzen’s new Integrative Model there are three primary predictors of behavior, behavioral intentions, environmental factors and skills and abilities (Fishbein, & Ajzen, 2010). Therefore, it can be said that for some behaviors, a change in BC’s is all that’s needed to mediate a behavior change. It also could be that we mediated changes in other behavioral antecedents that we did not measure, which resulted in the dietary changes. An exit interview with the children at the end of the intervention would have given more insight into this issue, and is suggested in future studies.

Finally, BMI percentiles significantly increased in this study, which was an unexpected outcome. One problem with the BMI percentile tool is the continuous nature of the scale, and is bound between the 1st and 99th percentile. A child barely in the 99th percentile is categorized the same way as a child well above the 99th percentile. Food Fit may have helped to decrease the weight of children in the 99th percentile, but due to this feature of the tool, the change would not have been captured. An additional explanation for this finding was that the instrument measuring dietary behaviors did not focus on overall eating behaviors. Rather it focused on selected eating behaviors such as milk, fruit and vegetable consumption. Therefore, while an increase in healthier eating habits was observed, overall eating may have increases as well, which could have resulted in unhealthy weight gain over the long term. Finally, the intervention was only a nutrition education program, and did not target other obesogenic behaviors, such as physical and sedentary activity.

Limitations

There are a few notable limitations to this study that need to be considered. One of the primary limitations is that instruments used in this study have not been validated in children. The CM-FBC was derived from a Food Behavior Checklist that has been validated among adults (Townsend, et al., 2003). This FBC was altered to be child appropriate by using grade-level appropriate language and omitting questions such as those focusing on food security. The surveys measuring SCT constructs were also not validated, however the root for the self-efficacy questions had been previously validated in an assessment of fruit and vegetables self-efficacy (Watson, Baranowski, & Thompson, 2006). This root was used in the same manner, but replaced fruit and vegetable behaviors with the behavior of each lesson. Another limitation to the study was that there was no control group to act as a comparison in order to evaluate the overall impact of the program. Participation between the lessons also widely varied due to the nature of the after school environment as attendance is not consistent as during school time. As discussed above, BMI percentile may not be the best measurement of weight status in children. Alternative methods of measuring weight status and changes in weight status need to be examined, such as BMI z-scores.

Implications for Future Research

This preliminary study suggests that the implementation of Food Fit in an after-school setting of 8-13 year-olds may result in some positive outcomes for SCT constructs and dietary behaviors. To expand upon these findings, one of the first goals of future research should be on validating the instruments utilized in the Food Fit study. Paring down the lessons from fourteen lessons, or spreading them across the entire school year, would be another step to consider since many children expressed burn out by the end of the intervention. Focusing on fewer concepts and repeating these concepts throughout the lessons might be a more effective strategy. Ideally, a randomized controlled trial would eliminate some of the threats to internal and external validity that were experienced in this study. A large, multi-site randomized controlled trial would be useful in validating potential mediating variables, and for understanding how the Food Fit intervention works for different subgroups under different circumstances. This information would be invaluable to refining Food Fit into a focused and effective intervention.

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