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CAN PHYSICAL ACTIVITY REINFORCE NUTRITION EDUCATION? EVALUATION OF
PHYSICAL ACTIVITY IN THE FAMILIES IN TRANSFORMATION (FIT), WELLNESS
PROGRAM FOR CHILDREN

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ABSTRACT

Objective: To determine if physical activity can reinforce nutrition education messages in the Families in Transformation (*FIT*) program at *HealthWorks!* located in Tupelo, Mississippi.

Methods: Children ages 7-13 participating in the (*FIT*) program made up the subjects for this study. A control and treatment group were observed using a nutrition reinforcement physical activity and a non-nutrition reinforcement activity during the regular physical activity nights of the (*FIT*) program, and a pre and post Nutrition Quiz, Health Habits Survey, anthropometric data, and Fitness data were obtained pre and post study to determine if the intervention had an impact on the subjects.

Results: There were no significant differences seen in pre and post BMI . The means for the fitness test results are found in Table 3. Significant ($p < 0.05$) differences were seen from pre-program to post-program from for the girls in push-ups ($14.00 + 6.23$ to $20.2 + 5.63$) and chair squats ($29.3 + 3.23$ to $32.4 + 4.59$) which in turned affected significant differences for the total group for push-ups ($14.31 + 7.62$ to $19.63 + 6.62$) and chair squats ($30.50 + 10.21$ to $34.44 + 7.39$). Significant ($p < 0.05$) differences were seen from pre-program to post-program for sit-ups for the total group ($39.63 + 5.80$ to $44.38 + 4.91$). Differences were almost significant in both girls and boys, but was not because sample size was smaller. The intervention group performed better on the nutrition quiz in 6 out of the 10 questions, 2 questions were 100% pre and post, 4 of the 10 questions being statistically significant. Children performed better on the post Nutrition Quiz than the pre Nutrition Quiz.

Conclusion: The nutrition reinforcement treatment group scored better on the post Nutrition Quiz in comparison to the control group. Nutrition reinforcement through physical activity does have a positive effect on nutrition education knowledge retention. Short term weight management programs do produce positive health effects.

DEDICATION

To my loving and supportive parents

ACKNOWLEDGEMENTS

This thesis would not have been completed without the encouragement from my committee members, Dr. Kathy Knight, Dr. Anne Bomba, and Dr. Charlotte Oakley. I would like to especially thank my advisor, Dr. Knight for her guidance, compassion, and for dedicating immense amounts of time helping me with my research. Dr. Knight suggested researching this program, and taught me that I was capable of writing a thesis before I knew that I could. I would also like to thank my professors collectively for teaching me the process of research along the way.

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I. INTRODUCTION

Childhood obesity has become a national epidemic, with Mississippi having one of the highest rates in the country (Kolbo, 2012). The principal cause of childhood obesity, too many calories consumed and inadequate calories burned, is a multidimensional problem. The long list of diseases associated with obesity can affect and children's health for a lifetime. More nutrition education and physical activity weight management programs that deliver successful, long-term results are needed to combat this epidemic. Short-term, effective, community-based health and wellness programs with a focus on physical activity and nutrition education could be a useful referral resource for physicians and other health care professionals with obese or at-risk patients, and in need of obesity prevention and/or treatment resources.

Review of Literature

Childhood obesity continues to be an accelerating concern for both the United States and the rest of the world. According to the Centers for Disease Control and Prevention (2015), 17.7% of American children, ages 6-11, are obese. According to the Mississippi State Department of Health (2015), 40 percent of Mississippi children are overweight or obese. This is a cause for great concern because childhood obesity has been associated with the increased risk for many preventable chronic diseases such as coronary heart disease, type 2 diabetes and some cancers (CDC, 2015). There are multiple causes of childhood obesity, lack of nutrition and food preparation education, physical inactivity, poverty, and restricted access to healthy food. Some schools do not mandate specific times for physical education, or much time for physical activity of any kind, during school hours, making it more difficult for children to get daily

physical activity (University of Georgia, 2012). This may be putting their health at risk, however. Children are impressionable and likely to continue actions instilled at a young age, hence healthy behaviors that develop early in life can become life-long habits (Boat, 2015).

While numerous childhood obesity interventions are underway, very few in Mississippi contain multifaceted components or are evidence-based. More interventions are needed with support from multiple sources to combat childhood obesity (Hoelscher, Kirk, Ritchie, & Cunningham-Sabo, 2013). According to the Partnership for Public's Health and the University of Illinois' Strategies for Building Community Public Health Partnerships, the most effective childhood obesity prevention programs should include information from different intervention areas and from a multitude of diverse groups (Partnership for Public Health, 2007; University of Illinois, 2006). The recent position paper on the treatment and prevention of pediatric obesity (Hoelscher, 2013) the Academy of Nutrition and Dietetics states:

In summary, prevention and treatment of pediatric overweight and obesity require synergy between personal and public responsibility in an integrated systems-level approach that includes consistent messages and environmental support across all sectors of society to achieve sustainable behavior change for life.

Nutrition Education

Nutrition education can be delivered in a variety of ways and in a multitude of settings. Children can be taught in schools, at home, and in extracurricular activities outside the home such as in clubs or activities in the community. Agencies and organizations such as the United States Department of Agriculture (Supplemental Food Program for Women, Infants, and Children, and Food and Nutrition Service), Department of Health and Human Services (public health, Food and Drug Administration, and, Centers for Disease Control and Prevention) are top sources available to Americans. The USDA's *ChooseMyPlate.gov* is a rich source for nutrition

education tools. It offers a daily food and activity tracker, a recipe database, food plan worksheets, body mass index calculator, pre-school growth charts, *MyPlate* food and nutrition quizzes and nutrition lesson plans for educators.

The position paper on the treatment and prevention of pediatric obesity by the Academy of Nutrition and Dietetics notes that specific weight loss diets, such as low-fat or low-carbohydrate diets account for little to no change in weight status of children, but increasing the overall intake of healthier foods and making small lifestyle changes to increase physical activity have a positive correlation with healthy weight management (Hoelscher et al, 2013). There is no specific diet or specific exercise to help combat obesity, but instead a combination of actions seems to be most effective.

Some short-term, multisession nutrition education programs have emphasized behavior change, specifically differentiating between healthful and less healthful choices among elementary students (Katz, et al., 2011; Rosemond, et al., 2015). In these studies, children were taught how to read nutrition labels, detect marketing deceptions, and increase their intake of fruits and vegetables. Results of the intervention were evaluated using pre and post-intervention data (Katz, et al., 2011; Rosemond, et al., 2015). After these programs children were able to distinguish between healthy and unhealthy food choices and increased their fruit and vegetable intake over the course of multiple sessions. Evaluations of such programs included surveys given to intervention and control groups before and after the program treatment (Katz, et al., 2011; Rosemond, et al., 2015).

There is limited research available on measures to confirm the retention of nutritional knowledge given to children. According to Schank (1995), the most preferred and successful types of learning include *seeing* and *doing*. It is suggested that children learn best and grasp new

concepts better through hands-on learning experiences as opposed to simply hearing information alone. Children grasp new concepts more fully when they can try out what they are told (Schank, 1995). Most studies include the delivery of nutrition education through group lectures and educational programs. The USDA, a primary resource for nutrition resources, applies nutrition education concepts such as the use of interactive nutrition education lessons that use tangible items to help children learn the nutrition principles being taught (USDA, 2016). The USDA resources included on *ChooseMyPlate.gov* has numerous activity tools, lesson plans, and physical activity games that reinforce nutrition education messages. All USDA nutrition education resources are consistent with the recommendations of the *Dietary Guidelines for Americans*, another primary resource for all healthy Americans over the age of 2 years, which state:

The *2015–2020 Dietary Guidelines* are designed to help Americans eat a healthier diet. Intended for policymakers and health professionals, this edition of the Dietary Guidelines outlines how people can improve their overall eating patterns — the complete combination of foods and drinks in their diet. This edition offers 5 overarching Guidelines and a number of Key Recommendations with specific nutritional targets and dietary limits (USDA, 2016).

Physical Activity

Nutrition education is a primary component of staying healthy and combatting childhood obesity, but there are other elements as well. According to the USDA (2016) nutrition education can be more effective when combined with physical activity. Including physical activity in schools is an essential way for children to get needed exercise, since they spend many daily hours there. Some schools do not mandate specific times for physical education, making it difficult for children to get any exercise at all—especially those who are not enrolled in physical activities outside of school. According to Rochman (2011), only 6 states — Alabama, Georgia,

Mississippi, North Carolina, Illinois and Iowa — abide by the standards from the National Association of Sports and Physical Education that school children participate in 150 minutes per week of physical education. According to the 2013 Mississippi Physical Education Framework, Mississippi public schools require 150 minutes of physical education a week, including aerobic, muscle strengthening, and bone strengthening exercises (Mississippi Department of Education, 2013-2014).

The USDA also encourages school wellness policies and mandates that, “each local educational agency participating in the National School Lunch Program or other federal Child Nutrition programs establish a local school wellness policy for all schools under its jurisdiction...including goals for nutrition promotion and education, physical activity, and other school-based activities that promote student wellness; and nutrition guidelines to promote student health and reduce childhood obesity for all foods available in each school district” (USDA Local School Wellness Policy Requirements, 2016). The most recent physical activity guidelines for Americans (2008), state:

The Physical Activity Guidelines for Americans published by the U.S. Department of Health and Human Services (HHS) is designed to provide information and guidance on the types and amounts of physical activity that provide substantial health benefits for Americans ages 6 years and older. Children and adolescents ages 6 to 17 years should accumulate 1 hour or more of physical activity daily. The 1 hour of activity should be mostly aerobic but should also include muscle-strengthening and bone-strengthening activities. Youth should include vigorous-intensity activity in this 1 hour on at least 3 days a week. They should also do muscle-strengthening activities on at least 3 days and bone-strengthening activities on at least 3 days a week” (p. 9).

While there are many exercises and physical activities for children, there are few resources for reinforcing nutrition education through physical activity. The USDA *ChooseMyPlate* website highlights the importance of not only nutrition but physical activity as

well, offering interactive nutrition quizzes, nutrition activities, and athletic games that reinforce nutrition education (USDA, 2016). It is also pertinent that implementing physical activity in schools is a good preventative measure for childhood obesity, but it is not enough to sufficiently combat the epidemic all together; it is suggested that children get physical activity outside of school as well as a part of their school curriculum (Hoelscher et al, 2013).

The *Let's Move!* campaign, launched by the First Lady, Michelle Obama, “ is a comprehensive initiative, dedicated to solving the problem of obesity within a generation, so that children born today will grow up healthier and able to pursue their dreams” (letsmove.gov, 2016). The *Let's Move!* Campaign states:

Everyone has a role to play in reducing childhood obesity, including parents, elected officials from all levels of government, schools, health care professionals, faith-based and community-based organizations, and private sector companies. Your involvement is key to ensuring a healthy future for our children.

Childhood obesity is not an easy issue to tackle, but much education and research has been dedicated to this problem. Evaluating research and curriculum and identifying which resources are the most helpful is the next important step in combating this disease.

Delivery of Nutrition Education and Physical Activity

Children are exposed to numerous areas where physical activity and nutrition education can be delivered. How are programs delivering the two main components of information to children; physical activity with nutrition education? A recent longitudinal study examined the health status of children ages 5 to 16 in an after-school wellness program, over the course of one school year. Pre and post intervention data was collected to determine any changes in health status (Messiah et al, 2015). The President's Council on Exercise's standardized testing protocol were used to test physical fitness, and two nutrition education lessons were given weekly, 20 to

30 minutes each time. The children's health status was evaluated using anthropometric data, blood pressure, physical fitness data, and pre/post nutrition surveys. Outcome measures were determined for normal weight and overweight/obese groups. Results suggested that the 10-month multifaceted program was beneficial to participants and necessary for weight management purposes, regardless of beginning weight status. The researchers concluded that these types of community-based programs are affordable and accessible resources for families in search of obesity prevention and treatment tools (Messiah et al, 2015).

Another short-term family-based weight management program examined overweight or obese children, ages 7-13, addressing diet and physical activity through education, skills training and motivational improvement (Fagg, 2005). During a 10-week program, children spent time with health professionals twice weekly. Anthropometric data was collected and body mass index was calculated pre and post. Surveys were administered throughout the course of the 10 weeks. Results included slight decreases in the children's body mass indexes and increases in the children's self-esteem levels (Fagg, 2005).

A short-term hospital-based weight management program emphasized healthy lifestyle habits as well as implementing physical activity to lower waist circumference and body mass indexes in overweight/at-risk children (da Silva, Fisberg, de Souza Pires, Nassar, & Sottovia, 2013). Results of the program verify that the best or healthier lifestyle choices are reinforced by encouraging participants to select more active behaviors compared to sedentary behaviors, within the exercise lesson. Using tangible items to teach children also helped produce positive results; for example, children were given a hands-on activity using food models during each nutrition education lesson. Reinforcing physical activity with other healthy lifestyle habits produced

successful outcomes, such as making healthier choices in food and increased nutrition knowledge.

Although research suggests that genetic factors may predispose individuals to weight gain (Harvard Medical School, 2009), there is growing awareness that changes in lifestyle habits underlie the current childhood obesity epidemic. A long-term primary school-based looked at lifestyle modifications to prevent obesity, which included dietary recommendations and physical activity (Giralt et al, 2011). Over the course of 3 years, pre and post questionnaires regarding physical activity and diet were administered. The researchers concluded that lifestyle change is critical including wholesome food, nutrition education curricula in schools including food experiments, regular physical activity outside of school, and especially increasing physical activity during school. As a result, there was a reduction in body mass index (Giralt et al, 2011). Current programs seem to use similar approaches when combatting childhood obesity. Most programs use a nutrition education lecture component then a separate physical activity lesson led by a different professional, given more frequently than the nutrition lecture (Fairclough et al, 2013; Messiah et al, 2015; Ning et al, 2014; Poe et al, 2013). Although these 2 components seem to be beneficial individually, they do not always reinforce one another.

What makes programs successful?

Most programs do have some type of positive outcome whether it is a small or large change, either way children are being exposed to beneficial information (Fairclough et al, 2013). There are few limitations that may hinder children and families from participating in such programs. Recently, wellness programs designed for families have become popular around the globe. In an evaluation of the Make It HAPPEN family education program, Watson-Jarvis,

Johnson and Clarke (2011) observed the components of the program that were found to be successful. According to the results, the children involved in the 12 week long program had an overall weight reduction, a positive outlook on the program, and an overall quality of life improvement. Additionally, the researchers received positive feedback from the families about the structure of the program, which gave the families the chance to support each other and share what they learned about nutrition and exercise (Watson-Jarvis et al., 2011). As children rely on their parents, family-approach short-term weight management programs can be beneficial to at-risk or overweight and obese children as well as their families.

Most programs are not free, and some families might not be financially equipped to participate in those that have a cost, although they may be eligible. The main goal is to get children and their parents on the same page, for a family-approach, as overweight to obese children cannot achieve a healthy without help of parents. This is a difficult task, as many parents have a misperception of what is and is not healthy, and may have a lack of knowledge when it comes to nutrition and healthy eating (Paul et al, 2015). According to research, some adults tend to underestimate overweight or obese children as being of normal weight, and children of obese mothers often underestimate the adult's size. Failure to identify overweight/obesity status among adults and children can lead to continued exposure to obesity-related comorbidities, which is a great concern for health professionals (Paul et al, 2015).

It is suggested that multi-level approaches to combat childhood obesity are the most influential, especially via community-level interventions. It can be noted that most short-term weight management wellness programs do not see a decrease in BMI or weight due to the short duration of time, however more so in long term programs; other positive effects of short term programs include cardiovascular health improvement, reduced diabetes risk factors and increases

in nutrition knowledge (Strauss, 2000). Most programs are generating positive results, such as better anthropometric data in children, compared to when they started the program, upon completion of the program (da Silva et al, 2013; Fairclough et al, 2013; Messiah et al, 2015; Ning et al, 2014; Poe et al, 2013; Sanders, 2014). It is important to assess the effectiveness of overweight and obesity programs helping children and families achieve healthy weights and implement healthful lifestyles, so that children and their families are better served and limited resources are used effectively. The question is, are these programs effective long term?

According to the literature reviewed, the childhood obesity prevention/weight management programs should be multi-faceted and include the family and community in order to be the most effective. Short-term studies do show significant results as far as health status, but not long-term effects of such programs (da Silva et al, 2013; Fairclough et al, 2013; Messiah et al, 2015; Ning et al, 2014; Poe et al, 2013; Sanders, 2014). Nutrition education and physical activity have been evaluated, and while these studies demonstrate weight management among children, having both components is more successful. While the two components for a healthy lifestyle, nutrition education and physical activity are both important, yet they differ from one another. This study will seek to determine if physical activity reinforces nutrition education and attempt to answer the following research questions:

- What is the baseline nutrition knowledge and fitness level of the students who participated in *FIT*?
- Is the physical activity component of the program effective?
- Can nutrition messages be reinforced through physical activity?

II. METHODS

Researchers from the Department of Nutrition and Hospitality at the University of Mississippi (UM NHM) conducted a study to evaluate the effectiveness of an 8 week weight management program, Families in Transformation (*FIT*), targeting overweight or inactive children and aiming to improve children's health through proper physical activity and nutrition education. This program is in partnership with the Health Care Foundation of North Mississippi (HCF) and North Mississippi Health Services (NMHS) is located at *Healthworks!* health education and fitness center in Tupelo, Mississippi.. This particular research is an evaluation of the physical activity component of the Families in Transformation (*FIT*) program and how it can reinforce nutrition education.

This study was conducted to evaluate the effectiveness of an 8 week weight management program, entitled *Families in Transformation (FIT)*, located at *Healthworks!* health education and fitness center in Tupelo, Mississippi. Children ages 8-13 and their parents were recruited by the *Healthworks!* staff, or were recommended by health professionals from NMHS, a sponsor of *Healthworks!*. The program and this evaluation study were both approved by the Institutional Review Boards of North Mississippi Health Services and the University of Mississippi. The children signed the assent forms, and parental consent was also received upon enrollment (script and forms found in Appendix A).

Families participating in the *FIT* program received incentives upon completion of the program, a \$100 gift card to Kroger, activity tracker (SQORD) wrist bands, and free passes to

the NMHS Wellness Center. The *FIT* startup fee was \$25 per child and was refunded upon completion of the program. No incentives were given to children or parents/guardians from the University of Mississippi research team for this study. A combination of food frequency questionnaires, nutrition knowledge surveys, weekly nutrition-related physical activity/games, and BMI data was used to evaluate the nutrition education and physical activity components of the *FIT* program.

Subjects

Children ages 7-13 and their parents were recruited by the *Healthworks!* staff, or were referred by physicians associated with NMHS. The program and this evaluation study were approved by the Institutional Review Boards of North Mississippi Health Services and the University of Mississippi. The Children signed the assent forms, and parental consent was also received upon enrollment (script and forms found in Appendix A).

Families received incentives to participate in the *FIT* program: a SQUORD wristband accelerometer (<https://www.sqord.com>) to record students' physical activity throughout each week, free passes to the North Mississippi Medical Center Wellness Center, and a \$100 gift card to Kroger upon completion of the program. The *FIT* registration fee of \$25 per child was refundable upon completion of the program. No incentives were given to children or parents/guardians from the University of Mississippi research team for this evaluation study. Children from the Tupelo, Mississippi area, ages 7-13 years, who were participating in the *FIT* program were also the participants in this study. As seen in Table 1 for the students, both genders were almost equally represented for this study, and there was some ethnic diversity within the participants, 56% white, 25% black, and 19% multiracial. As seen in Table 2, not all

participants were at risk for obesity. The females' baseline weight of 57.89 ± 18.01 was almost a full standard deviation from the males' baseline weight of 50.96 ± 15.31 . Some participants were referred to the program due to obesity risk, poor nutrition habits, high blood pressure, or poor physical activity status. Some families voluntarily signed up for *FIT* to become more active and healthier without the referral from a physician.

Table 1. Demographic characteristics of *FIT* participants.

Variable	Students (n = 18)	Parents (n=13)
Mean age (years)	10.52 (1.26)	42.5 (3.92)
Gender		
Males	44%	8%
Females	56%	92%
Ethnicity		
White	56%	62%
Black	25%	23%
Hispanic	0%	0%
Asian	0%	8%
Multiracial	19%	0%
Other	0%	8%
Residence		
Apartment	13%	8%
House	75%	77%
Mobile home	13%	15%
Education level (parents only)		
8 th grade		0%
High School/GED		0%
College/University		85%
Graduate/Professional		15%

Standard deviations are reported in parentheses.

Table 2. Anthropometric and health data for *FIT* student participants.

Measure	Females	Males	Total
Height (cm)			
Pre	142.38 (11.19)	140.61 (16.18)	142.57 (12.42)
Post	143.58 (11.56)	144.62 (13.29)	143.71 (12.32)
Weight (kg)			
Pre	57.89 (18.01)	50.96 (15.31)	52.51 (16.42)
Post	60.17 (18.66)	49.96 (15.54)	53.52 (16.76)
BMI z score			
Pre	2.046 (0.543)	1.352 (1.031)	1.720 (0.860)
Post	2.161 (0.427)	1.340 (0.990)	1.775 (0.836)
Systolic BP (mm Hg)			
Pre	113 (12.24)	110.63 (12.83)	111.31 (12.42)
Post	113 (11.69)	109.00 (12.90)	112.25 (13.55)
Diastolic BP (mm Hg)			
Pre	67.82 (6.00)*	60.00 (10.86)	66.63 (8.81)*
Post	59.90 (9.31)*	66.00 (12.82)	63.75 (11.81)*
Resting heart rate (beats/min)			
Pre	94.27 (11.04)*	76.78 (8.45)	83.69 (8.60)*
Post	98.80 (22.51)*	90.140 (7.68)	93.13 (20.73)*

Standard deviations are reported in parentheses.

* $p < 0.05$.

Procedures

FIT was offered over the course of 8 weeks in the early spring of 2016. The program was supported by registered dietitians, school physical education instructors, and health educators and volunteers from (*FIT*), who were experienced in working with youth. Both parents and children were required to attend the weekly nutrition education lessons which were led each Monday night by a registered dietitian from the North Mississippi Medical Center. The first 45 minutes was dedicated to the topic of the week via classroom instruction for the parents and children together, and the second hour dedicated to a questions-answer session for parents and physical activity for the children.

Children were required but parents were only encouraged to attend and participate in the twice-weekly physical activity nights on Tuesdays and Thursdays. These physical activity lessons were group fitness-based and were conducted by certified physical education instructors, and included cardio-focused circuits that changed weekly, at the discretion of the physical education instructors. Children and parents also received weekly exercises that could be performed outside the program to encourage their skill development as the program progressed.

Parents and children were given supporting resources (such as nutrition handouts and exercise bands). Education other than the weekly nutrition lessons included a tour of a local grocery store for parents, led by the registered dietitian, and a cooking demonstration for children and parents.

Children were also given activity trackers at the beginning of the program, to be worn on the wrist over the 8 weeks and which were linked to a computer program called SQORD to track their movement and physical activity at all times. The more movement the children made, the

more points they earned within SQORD, allowing them to purchase/gain accessories for their avatar, as motivation.

Physical Activity Intervention

To determine if a nutrition-related physical activity can reinforce nutrition education to increase nutrition knowledge, the children who participated in the physical exercise lessons provided by *FIT* were assigned to a control or intervention group. Each Thursday evening (6 times throughout the program) the children in the intervention group participated in a short nutrition-related physical activity during the last 10 minutes of the regular exercise session with the physical education instructor. This activity was designed to reinforce the nutrition message delivered by the dietitian at the beginning of the week and involved some type of relay race. Each week the children in the treatment group read various parts of the food model label before the relay. Each relay was designed around the nutrition lesson theme of the week. After the short intervention lesson, students sprinted down and back across the room dropping their food models into the correct MyPlate box. Children were not given the same type of food each week, instead they had a new food each time they ran the relay. Meanwhile, the control group did a regular relay with buckets and plastic balls, having no nutrition-related message incorporated, each week during the same time as the treatment group. The topics covered by the registered dietitian, and subsequently by the reinforcing activities were:

1. MyPlate. Students ran a relay race dropping food models into boxes labeled as the MyPlate food groups (protein, dairy, fruit, vegetables, and grain).
2. Label reading. Students ran intervals after reading nutrition labels on food models.
3. Serving size. Students were asked to estimate serving sizes among food models.

4. Grocery store survival. Students participated in a scavenger hunt to find healthy food items in the *HealthWorks!* simulated grocery store.
5. Healthy snacking. Students were asked to choose between healthy and not so healthy snacks with food models.
6. Healthy hydration. Students were asked to choose between healthy and not so healthy drinks with food models.

The 2 “teams” which the children called each other (the control v. the treatment group), ran their relays simultaneously to see which team could finish more quickly, sprinting to either the food group boxes (treatment group) or the buckets (control group). Both groups were required to sprint down and back 2 times across the room, dropping off their 2 items until all members of their team got rid of their cardboard food (treatment) or plastic balls (control). Whichever team finished first was named the winner, but the research team gave no incentive or prizes. The “teams” stayed consistent each week, and each team tried to out-race the other over the length of the program.

Measures

A physical assessment was performed on the first and last night of *FIT* on each child obtaining anthropometric data. The physical assessment included height, weight, BMI, resting heart rate, blood pressure, and 4 physical fitness exercises can be found in Table 2 and Table 3. Heights were measured with an improvised stadiometer and weights were measured with a home-style scale. To measure changes in health and dietary habits, students and parents were asked to complete the Student and Parent Health Habit Survey and Nutrition Quiz (found in Appendix B) also given the first and last night of *FIT* during program hours. Registered

dietitians with research experience reviewed this survey and quiz to validate the questions beforehand. The research team requested that parents do not help children when completing the Nutrition Quiz and Survey. A food frequency questionnaire was administered each Monday based on a 24 hour recall of eating habits, and consumption was analyzed weekly throughout the program. A parent satisfaction survey was given to parents to assess their overall satisfaction with *FIT* post program. The measures investigated in this study included changes in dietary habits, anthropometric and physical fitness/assessment data, behavior change, and nutrition-related knowledge.

Data Analysis

Demographic and beginning and ending heights and weights were analyzed using descriptive statistics. Pre and post intervention BMI was calculated for each student according to the following formula:

$$\text{BMI} = \frac{\text{weight (kg)}}{\text{height (cm)}^2}$$

BMI was then converted to age and gender-specific z scores according to the guidelines provided by the Centers for Disease Control and Prevention (CDC, 2015). The use of BMI z scores rather than direct BMI values helped to prevent factors such as differences in age and rate of growth from confounding the data. Pre and post-intervention mean BMI z scores and pre and post-intervention mean fitness test scores were compared using paired t-test with an alpha of 0.05. Chi square analysis was used to determine any category changes from pre to post intervention for the total program and for the nutrition education reinforcing physical activity.

III. RESULTS

When the students' BMI z scores were compared to, the mean BMI z scores for females and males, 2.046 ± 0.543 and 1.352 ± 1.031 respectively, were indicative of health risk. When compared to blood pressure tables from the National Heart Lung and Blood Institute (2004) the mean blood pressures for both females and males were around the 90th percentile. Resting heart rate, however, was in the normal range of 70 – 120 beats per minute (Williams, 2015).

Significant differences between pre and post-program means of anthropometric and health data were seen for diastolic blood pressure in girls, changing from 67.82 ± 6.00 to 59.90 ± 9.31 and for the group as a whole (66.63 ± 8.81 to 63.75 ± 11.81). Resting heart rate also changed significantly for boys (76.78 ± 5.45 to 90.10 ± 7.68) and the total group (83.69 ± 8.60 to 93.13 ± 20.73).

Percent of student responses to the Health Habit Questionnaire can be found in Tables 3a and 3b. Significant differences that were found between pre-program and post-program answers:

- For question 5, the students reported watching less TV shows during the week as 13 percent answered “do not watch TV”, 65 percent answered “2 to 3 shows”, and 24 percent answered “4 to 6 shows” pre-program; versus 13 percent, 69 percent, and 19 percent, respectively, post-*FIT* ($p < 0.05$). In question 5, the percentages of answers indicated that they also watched television for less time, although the difference was not significant.

Table 3a. Student results from the pre-FIT health habit survey.

Question	Pre-program survey answers				
1. Do you read food labels?	Always 12%	Most of the time 12%	Sometimes 41%	Rarely 12%	Never 24%
2. At meals I eat	Too much 0%	Little too much 18%	The right amount 71%	Not enough 6%	I don't know 6%
3. When it comes to snacks I eat	Too much 0%	Little too many 18%	The right amount 47%	Hardly any 12%	I don't eat snacks 6%
4. During the week, how much time do you watch TV?	I don't watch TV 12%	Less than 1 hour 35%	1-2 hours per day 29%	3-4 hours per day 24%	More than 4 hours 0%
5. During the week, how many TV shows do you watch?	I don't watch TV 12%	2-3 shows 65%	4-6 shows 24%	6 or more shows 0%	
6. During one weekday, how many hours do you spend on cellphones, tablets, or the computer?	I don't use these items 6%	Less than 1 hour 35%	1-2 hours 35%	2-3 hours 12%	3-4 hours 12%
7. During the weekend, how much time do you watch TV?	I don't watch TV 18%	Less than 1 hour 18%	1-2 hours 35%	3-4 hours 18%	More than 4 hours 12%
8. During the weekend, how many TV shows do you watch?	I don't watch TV 18%	2-3 shows 47%	4-6 shows 29%	more than 6 shows 6%	
9. During one weekend day, how many hours do you spend on cellphones, tablets, or the computer?	I don't use these items 0%	Less than 1 hour 24%	1-2 hours 41%	3-4 hours 12%	More than 4 hours 24%
10. How much physical activity do you get in a normal day?	less than 15 minutes 6%	15-30 minutes 41%	30-60 minutes 18%	more than 60 minutes 35%	
11. How many days are you physically active during the week?	0-2 days 12%	3-4days 24%	5-7 days 65%		

Table 3b. Student results from the post-FIT health habit survey.

	Post-program survey answers					Probability
	Always	Most of the time	Sometimes	Rarely	Never	
1. Do you read food labels?	13%	13%	44%	13%	19%	0.251
2. At meals I eat	Too much	Little too much	The right amount	Not enough	I don't know	
	0%	19%	69%	6%	6%	0.555
3. When it comes to snacks I eat	Too much	Little too many	The right amount	Hardly any	I don't eat snacks	
	0%	19%	44%	13%	6%	0.398
4. During the week, how much time do you watch TV?	I don't watch TV	Less than 1 hour	1-2 hours per day	3-4 hours per day	More than 4 hours	
	13%	38%	31%	19%	0%	0.399
5. During the week, how many TV shows do you watch?	I don't watch TV	2-3 shows	4-6 shows	6 or more shows		
	13%	69%	19%	0%		< 0.05
6. During one weekday, how many hours do you spend on cellphones, tablets, or the computer?	I don't use these items	Less than 1 hour	1-2 hours per day	2-3 hours	3-4 hours	
	6%	38%	31%	13%	13%	0.331
7. During the weekend, how much time do you watch TV?	I don't watch TV	Less than 1 hour	1-2 hours	3-4 hours	More than 4 hours	
	19%	19%	31%	19%	13%	0.095
8. During the weekend, how many TV shows do you watch?	I don't watch TV	2-3 shows	4-6 shows	more than 6 shows		
	19%	31%	44%	6%		0.221
9. During one weekend day, how many hours do you spend on cellphones, tablets, or the computer?	I don't use these items	Less than 1 hour	1-2 hours	3-4 hours	more than 4 hours	
	0%	25%	38%	13%	25%	0.457
10. How much physical activity do you get in a normal day?	less than 15 minutes	15-30 minutes	30-60 minutes	more than 60 minutes		
	6%	44%	19%	31%		< 0.05
11. How many days are you physically active during the week?	0-2 days	3-4 days	5-7 days			
	13%	25%	63%			0.209

- For question 10, when asked at the beginning of the program how much physical activity they perform in a single day 41 percent of the students chose the answer “15 to 30 minutes”, 18 percent chose “30 to 60 minutes” and 35 percent chose “more than 60 minutes”. After the program 44 percent of the students chose the answer “15 to 30 minutes”, 19 percent chose “30 to 60 minutes” and 31 percent chose “more than 60 minutes” ($p < 0.05$).

Effects on Snacking. To assess snacking habits the participants were asked “ When it comes to snacks I eat...” and asked to respond “too much”, “little too many”, “the right amount”, “hardly any”, or “I don’t know”. The most frequent response post intervention was “the right amount” (44%) , a slight decrease from the pre intervention survey (47%). There was no significant difference found in the children’s pre-intervention response and post-intervention response.

Effects on Screen Time. To evaluate the time spent watching television, using cellphones, tablets, or computers 6 questions were asked. Participants were asked to identify the amount of time they spent watching television during the week and most frequently responded “less than one hour” for both pre-and post- surveys. (35%, 38% respectively). However, there was a decrease in the response “3-4 hours per day”. Twenty-four % of children responded with “3-4 hours per day” pre intervention and decreased that response in post intervention (19%). Respondents were then asked the number of hours that they spend using cellphones, tablets, or computers on one weekday. Post-intervention results show that there was a decrease in the response “1-2 hours per day” (31%) and an increase in “less than 1 hour per day” (38%). Although no significant difference was found, it may be concluded that students reduced screen time from 1 to 2 hours per day to less than one hour per day post intervention. In addition to this,

when asked “during the weekend, how much time do you watch TV?” there was no significant difference found in children’s responses pre- and post- intervention. However, a significant difference was found among the responses of the parents. Parents decreased television time on the weekends.

Effects on Physical Activity. To evaluate physical activity habits the question “how much physical activity do you get in a normal day” was asked. The most frequent response among children pre intervention was “15-30 minutes” (41%) and remained the most frequent answer post intervention (44%). However, using chi square analysis, a significant difference was found in physical activity in a normal day. Results show that there was an increase in both parents and children.

Both the control and the reinforcing intervention students learned more nutrition knowledge. The percentages of student participants who selected each answer on the pre and post-program nutrition and fitness quiz are found in Tables 4a and 4b.

Table 4a. Student results from the pre-FIT nutrition and fitness quiz.

Questions	Pre-Program survey results				
How many food groups are shown in MyPlate?	6	10	5	1	I don't know
How many cups of fruit should you eat each day?	10% none	0% 1 Or 2	55% 3 or more	5% I don't know	30%
When buying fruit juice, how often is it 100% juice?	0% Almost always	50% sometimes	45% almost never	5% I don't know	I don't drink juice 15%
About how much of your plate should be fruits and vegetables?	40% one quarter	30% one half	0% three quarters	15% all of it	
A serving size is	25% the amount in the package	70% the amount you eat at one meal	0% depends n the food and is listed on the label	5% is different for everyone	
A food that is labeled "low fat" always has fewer calories than the regular version	15% TRUE	30% FALSE	45%	10%	
Which of the following is the healthiest snack?	50% Cookies and milk	50% canned soda and raisins	peanut butter toast and an orange	cheese, crackers & fruit punch 20%	
you should warm up every time you exercise	5% TRUE	0% FALSE	75%		
You can get more fit by...	95% shopping	5% raking leaves	doing laundry	cooking	
What is a balanced exercise plan?	15% running, weights, stretch	80% running, weights, tennis	0% running, cycling, tennis	5% weights, hiking, leg lifts	
	50%	5%	10%	35%	

Table 4b. Student results from the post-FIT nutrition and fitness quiz.

	Post-Program survey results					Probability
How many food groups are shown in MyPlate?	6	10	5	1	I don't know	
	0%	0%	94%	0%	6%	0.738
How many cups of fruit should you eat each day?	None	1 or 2	3 or more	I don't know		
	0%	47%	41%	12%		< 0.001
When buying fruit juice, how often is it 100% juice?	Almost always	sometimes	almost never	I don't know	I don't drink juice	
	29%	12%	12%	12%	12%	0.109
About how much of your plate should be fruits and vegetables?	one quarter	one half	three quarters	all of it		
	0%	88%	6%	6%		< 0.001
A serving size is	is the amount in the package	is the amount you eat at one meal	depends on the food and is listed on the label	is different for everyone		
	0%	29%	59%	12%		0.157
A food that is labeled "low fat" always has fewer calories than the regular version	TRUE	FALSE				
	29%	71%				0.044
Which of the following is the healthiest snack?	cookies and milk	canned soda and raisins	peanut butter toast and an orange	cheese, crackers & fruit punch		
	0%	0%	82%	18%		0.288
you should warm up every time you exercise	TRUE	FALSE				
	100%	0%				
You can get more fit by...	shopping	raking leaves	doing laundry	cooking		
	29%	71%	0%	0%		
What is a balanced exercise plan?	running, weights, stretch	running, weights, tennis	running, cycling, tennis	weights, hiking, leg lifts		
	65%	0%	18%	18%		< 0.001

Chi square analysis of the means student scores for the pre and post-*FIT* nutrition and fitness quiz between students who received the nutrition education reinforcing physical activity and the control group revealed that the students who received the reinforcing physical activity performed significantly better on 4 questions. Students who received the intervention answered correctly more often than the control group to questions about amount of servings of fruit per day, how much of the plate should be fruits and vegetables, calorie level of foods labeled “low fat”, and what is a balanced exercise plan. All student participants correctly answered “True” to Question 8, You should warm up every time you exercise. Although questions 1 and 7 did not show statistically significant results, the intervention group still scored higher than the control group.

Table 5. Chi Square analysis of student nutrition and fitness quiz scores, before and after the nutrition education reinforcing physical activity.

Question	Chi Square	Probability of a larger value
1. How many food groups are shown in MyPlate?	0.11	0.739
2. How many cups of fruit should you eat each day?	29.64	< 0.001
3. When buying fruit juice, how often is it 100 % fruit juice?	2.57	0.109
4. About how much of your plate should be fruits and vegetables?	85.10	< 0.001
5. A serving size is...	2.00	0.157
6. A food that is labeled “low fat” always has fewer calories than the regular version?	4.05	< 0.05
7. Which of the following is the healthiest snack?	1.13	0.289
8. You should warm up every time you exercise ¹	--	--
9. You can get more fit by	0.00	1.000
10. What is a balanced exercise plan?	40.50	< 0.001

¹ This question was answered correctly by every participant both before and after the program.

Figure 1 illustrates the numbers of correct student responses for the pre and post-FIT nutrition and fitness quiz. Figure 2 illustrates the number of correct student responses for the nutrition and fitness quiz for the control versus reinforcing physical activity group.

Figure 1. Number of correct student responses for the pre and post-FIT nutrition and fitness quiz.

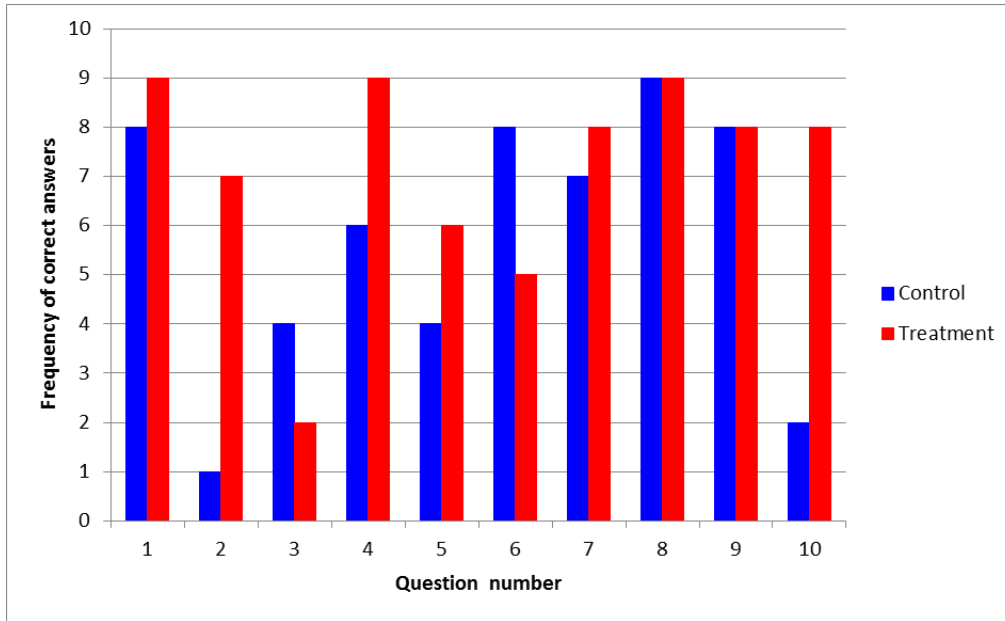
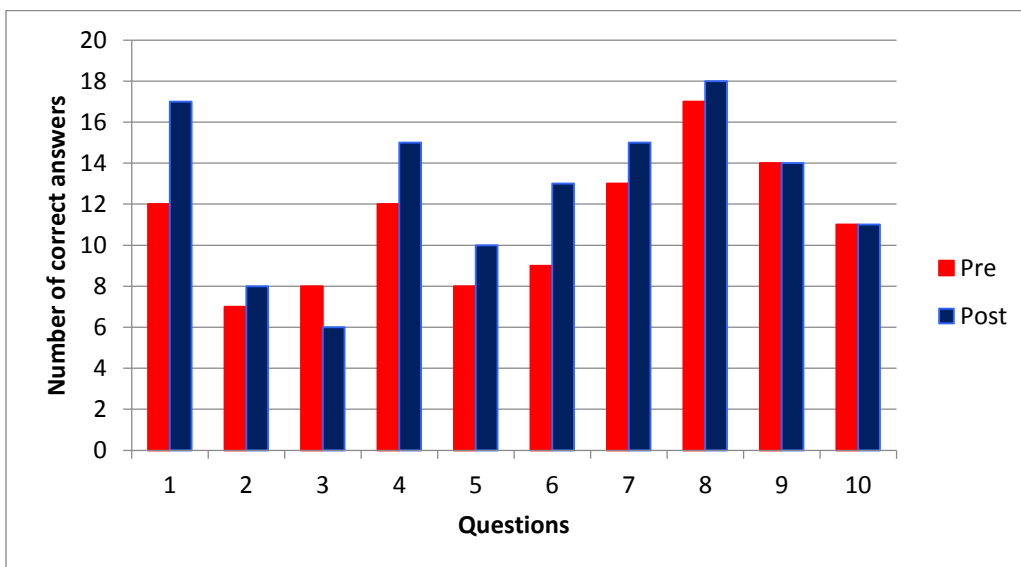


Figure 2. Number of correct student responses for the nutrition and fitness quiz for the control versus reinforcing physical activity group.



The means for the fitness test results are found in Table 6 and when compared to the *Fitnessgram* performance standards (Plowman and Meredith, 2014), indicate that the students in this study were relatively fit. The mean fitness scores from both pre and post-*FIT* exceeded the *Fitnessgram* performance standards in every category. Significant ($p < 0.05$) differences were seen from pre-program to post-program from for the girls in push-ups (14.00 ± 6.23 to 20.2 ± 5.63) and chair squats (29.3 ± 3.23 to 32.4 ± 4.59) which in turned affected significant differences for the total group for push-ups (14.31 ± 7.62 to 19.63 ± 6.62) and chair squats (30.50 ± 10.21 to 34.44 ± 7.39). Significant ($p < 0.05$) differences were seen from pre-program to post-program for sit-ups for the total group (39.63 ± 5.80 to 44.38 ± 4.91). Differences were almost significant in both girls and boys, but were not significant because sample size was smaller.

Table 6. Mean pre and post-*FIT* student fitness test results

	Push-up		Sit-up		Chair squat		Step test	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Total n = 20	14.31* \pm 7.62	19.63* \pm 6.62	39.63* \pm 5.80	44.38* \pm 4.91	30.50* \pm 10.21	34.44* \pm 7.39	123.06 \pm 12.27	119.13 \pm 11.19
Females n = 11	14.00* \pm 6.23	20.2 \pm 5.63	37.82 \pm 6.72	42.9 \pm 6.66	29.3 \pm 3.23	32.40* \pm 4.59	122.6 \pm 14.25	122.9 \pm 7.05
Males n = 9	12.11 \pm 7.37	15.5 \pm 9.84	39.78 \pm 6.08	43.75 \pm 4.98	34.78 \pm 13.27	36.38 + 8.81	121.78 + 14.01	202.89 + 266.5 5

IV. DISCUSSION

Did the reinforcement activity actually help children learn and reinforce nutrition education? The survey/nutrition quiz results comparing control and treatment post test scores showed that there was a positive change: either answers stayed the same or the treatment group improved on the post Nutrition Quiz. Intervention students improved on certain questions (1, 2, 4, 7, 10), did not excel on questions (3 and 6), and answered questions correctly the first and second time (8 and 9). However, question 3 was formatted differently than the rest of the Nutrition Quiz, being a question with answers given on a scale rather than right and wrong. Overall, the total children performed better on the post-Nutrition Quiz when comparing the pre-Nutrition Quiz.

Additionally, if an incentive was given upon completion of the control and treatment group activities, the children may have focused more and would have had more positive post Health Habit Survey and Nutrition quiz results. However, the children seemed to enjoy the reinforcement/control activities at the end of the hour, as it was a “race” against the other team and something to look forward to at the end of the week. As previously stated in the literature, short term programs usually do not see any lowering of BMI, especially in children. The American Heart Association (2016) emphasizes the importance of children keeping a healthy heart by suggesting that they maintain a healthy weight, participate in regular physical activity, and consume a heart-healthy diet to avoid high blood pressure and potential heart-related diseases. So lowering diastolic may have significant impact on future health of children.

Overall, the children's diastolic blood pressure went down in this study. There was also a large standard deviation in weight, which explains why weight did not go down.

There are several recommendations for the program for improvement. First, would be requiring parents and children to attend all nights of the program and giving an incentive for perfect attendance to reduce attrition, potentially shortening the program to twice a week instead of 3 times a week. For future programs, the nutrition education presenter and the physical activity reinforcement should plan specific nutrition reinforcement activities together, and have the parents participate in the reinforcement activities as well. Lengthening the program to more than 8 weeks would allow for more physical activity, nutrition education, and reinforcement activities, also allowing for opportunity for change in BMI and anthropometric data. Lastly, a suggestion to the program would be to potentially invest in some anthropometric data measurement equipment (i.e., body composition monitor and mechanical beam scale with height rod).

Limitations

For this study, there are limitations to consider. Some limitations include small sample size in addition to varying parent and child participation of *FIT*. Furthermore, self-reported data was the primary source analyzed for this study including the Health Habits Survey, Nutrition Quiz, and Food Frequency Questionnaire. Children may have not taken their time to fully focus on the survey, quiz, and the food frequency questionnaires as the time to perform these tasks was limited. Another observation was that it was difficult for families to come to *FIT*, children and their parent(s), all three nights a week, every week. If the program was only 2 nights a week, perhaps retention would not be an issue. The SQORD activity tracker bracelets were not an actual indicator after all. Many children would shake their wrists in order to earn points, giving a

false reading of physical movement. If there were a way for children to not encourage each other to do that, the SQORD bracelets would be a better source of data. However, they were a great incentive of the program, as they kept it fun for children to pick their avatar, earn points, and they encouraged physical activity at home and outside the program.

Conclusion

The program had a significant impact on the fitness of these children. This study shows that short-term programs do result in positive outcomes. Although behaviors and body mass indexes did not significantly change, there was a positive change in nutrition knowledge via survey and the nutrition quiz, and more positive food frequency data results over the length of the program. The food frequency data, increased nutrition knowledge, and lower blood pressures of the children certainly make the case for a successful program. Lastly, this program overall is an asset to the community, helping families from the area become healthier. The friendly staff, the abundant resources and information given for a healthy lifestyle, and the fun, unique exercises taught throughout the program made for a great experience for participants. With the lingering obesity epidemic, the United States needs more programs like these to help overweight and obese families, or families who just want to learn about nutrition, obtain physical activity and stay healthy.

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VI. APPENDIX

Appendix A
Parental Consent
and
Student Assent

Appendix A.1. Parental consent form.

Consent for You and Your Child to Participate in Research

Study Title: Development and Evaluation of *Families in Transition (FIT)*, a wellness center based weight management program for children.

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and

The purpose of this study

We want to measure what effects the *Families in Transition (FIT)* program will have on your child's eating habits, weight, and fitness level. We also want to know how your support effects the results your child gets from the program.

What you and your child will do for this study

You and your child will allow *HealthWorks* to share your child's **unidentified** height, weight, and fitness scores with us. Our child will also be asked to wear an "activity tracker" that will measure their physical activity for the eight weeks of the program. We will also ask you and your child to take brief surveys at the beginning and at the end of the program. These surveys will be about their eating habits, what they have learned in the program, and how this does or does not affect how the family eats and exercises. Finally, your child will be asked five or six questions each Thursday evening. These will be questions about their diet and eating habits.

Time required for this study

This study will take about 1 hour for the 1st day and 1 hour for the last day of the program and about 15 extra minutes per week.

Possible risks from participation

There are no known risks for you or your child's participation in the study.

Benefits from participation

There are no known incentives and/or benefits for you or your child's participation in the study.

Confidentiality

All health information in the study will be collected from you and your child by *HealthWorks* and given to the researchers anonymously: it will not be possible for anyone, even the researchers, to associate you with your responses or your child's responses.

Right to Withdraw

You do not have to volunteer for this study, your child does not have to participate, and there is no penalty if either of you refuses. If you and your child start the study and either one of you decides that you do not want to finish, just tell the experimenter. Whether or not you and your child participate or withdraw will not affect your current or future relationship with *HealthWorks*, North Mississippi Health Systems, or with the University of Mississippi, and it will not cause you to lose any benefits to which you are entitled.

Protected Health Information

Protected health information is any personal health information which identifies you or your child in some way. The data collected in this study includes: height, weight, and fitness scores. A decision to participate in this research means that you agree to the use of your health information and your child’s health information for the study described in this form. This information will not be connected to your child and will not be released beyond the purposes of conducting this study. The information collected for this study will be kept only until July 1, 2016. You may request access to this information at any time.

IRB Approval

This study has been reviewed North Mississippi Health Systems’ and The University of Mississippi’s Institutional Review Boards (IRB). The IRB has determined that this study fulfills the human research subject protections obligations required by state and federal law and University policies. If you have any questions or concerns regarding your rights or your child’s rights as a research participant, please contact the IRB at (662) 915-7482 or

Please ask the researcher if there is anything that is not clear or if you need more information. When all your questions have been answered, then decide if you want your child to be in the study or not.

Statement of Consent

I have read the above information. I have been given an unsigned copy of this form. I have had an opportunity to ask questions, and I have received answers. I consent to participate in the study and to allow my child to participate.

Furthermore, I also affirm that the experimenter explained the study to me and told me about the study’s risks as well as my right and my child’s right to refuse to participate and to withdraw.

Signature of Participant _____ Date _____

Printed name of Participant

Printed name of Participant’s Child

**NOTE TO PARTICIPANTS: DO NOT SIGN THIS FORM
IF THE IRB APPROVAL STAMP ON THE FIRST PAGE HAS EXPIRED**

Appendix A.2.

CHILD ASSENT

Oral Assent Script with Record of Child's (Aged 7-13) Response

I would like to ask you to help me with a project that I am doing at The University of Mississippi. If you agree, you would allow *HealthWorks* to give me your height, weight, and fitness scores without your name on them. You will also be asked to wear an "activity tracker" that will measure your physical activity for the eight weeks of the program. We will also ask you take a 12 question survey at the beginning and at the end of the program. These surveys will be about their eating habits, what you have learned in the program. You will also be asked five or six questions each Thursday evening about your diet and eating habits. The surveys will take about 15 minutes. The questions will take about 10 minutes each Thursday.

What questions do you have about what you will do for me?

Will you do this?

Name: _____ Date: _____

Response: YES NO

Appendix B.

Instruments

Appendix B.1. Parent Pre and Post-Program Health Habit Survey and Nutrition and Fitness Quiz.

Project FIT Parent/Guardian Questions

A. Survey data. Circle answer.

1. Do you read food labels?
 - a. Always
 - b. Most of the time
 - c. Sometimes
 - d. Rarely
 - e. Never

2. At meals I eat
 - a. Too much
 - b. A little too much
 - c. Just the right amount
 - d. Not enough
 - e. I don't know

3. When it comes to snacks, I eat
 - a. Too much
 - b. A little too many
 - c. Just the right amount
 - d. Hardly any
 - e. I don't eat snacks
 - f. I don't know

4. Which of the following is protein?
 - a. Eggs
 - b. Meat
 - c. Beans
 - d. All of the above
 - e. I don't know

5. During the week (Monday through Friday or your work week if different), how much time do you watch TV?
 - a. I don't watch TV
 - b. Less than 1 hour
 - c. 1 – 2 hours a day
 - d. 3 – 4 hours a day
 - e. more than 4 hours a day

6. During the week, (Monday through Friday or your work week if different), how many TV shows do you watch?
 - a. I don't watch TV
 - b. 2 – 3 shows
 - c. 4 – 6 shows
 - d. 7 or more shows
7. During one weekday (Monday through Friday or one of your work days, if different), how many hours do you spend on cell phones, tablets, or the computer?
 - a. I don't use these items.
 - b. Less than 1 hour
 - c. 1 – 2 hours
 - d. 3 – 4 hours
 - e. More than 4 hours
8. During the weekend (or one of your off days, if different), how much time do you watch TV?
 - a. I don't watch TV
 - b. Less than 1 hour
 - c. 1 – 2 hours a day
 - d. 3 – 4 hours a day
 - e. more than 4 hours a day
9. During the weekend (or one of your off days, if different), how many TV shows do you watch?
 - a. I don't watch TV
 - b. 2 – 3 shows
 - c. 4 – 6 shows
 - d. 7 or more shows
10. During weekend (or one of your off days, if different), how many hours do you spend on cell phones, tablets, or the computer?
 - a. I don't use these items.
 - b. Less than 1 hour
 - c. 1 – 2 hours
 - d. 3 – 4 hours
 - e. More than 4 hours
11. How many days are you physically active each week?
 - a. 0 – 2 days
 - b. 3 – 4 days
 - c. 5 – 7 days

12. How much physical activity (exercise or physical work) do you get in an average day?
- a. Less than 15 minutes
 - b. 15 – 30 minutes
 - c. 30 – 60 minutes
 - d. More than 60 minutes

B. Nutrition quiz. Circle the correct answer(s).

1. How many food groups are shown in MyPlate?
- a. 6
 - b. 10
 - c. 5
 - d. 1
 - e. I don't know
2. How many cups of fruit should you eat each day?
- a. None
 - b. 1 or 2
 - c. 3 or more
 - d. I don't know
3. When buying fruit juice, how often is it 100 % fruit juice?
- a. Almost always
 - b. Sometimes
 - c. Almost never
 - d. I don't know.
 - e. I do not drink juice.
4. About how much of your plate should be fruits and vegetables?
- a. One quarter
 - b. One half
 - c. Three quarters
 - d. All of it
5. A serving size
- a. Is the amount in the package.
 - b. Is the amount you eat at one meal.
 - c. Depends on the food and is listed on the label.
 - d. Is different for everyone.

6. A food that is labeled “low fat” always has fewer calories than the regular version
 - a. True
 - b. False
7. Which of the following is the healthiest snack?
 - a. Cookies and milk
 - b. Canned soda and raisins
 - c. Peanut butter on toast and an orange
 - d. Cheese and crackers and fruit punch
8. You should warm up every time you exercise
 - a. True
 - b. False
9. You can get more fit by
 - a. Shopping
 - b. Raking Leaves
 - c. Doing Laundry
 - d. Cooking
10. What is a balanced exercise plan?
 - a. Running, weight lifting, stretching
 - b. Running, weight lifting, tennis
 - c. Running, cycling, tennis
 - d. Weight lifting, hiking, leg lifts

Participant data

1. My gender
 - a. Male
 - b. Female
2. My education level
 - a. 8th grade
 - b. High school or GED
 - c. College or university
 - d. Graduate and/or professional school
3. My ethnicity
 - a. Black
 - b. White
 - c. Asian
 - d. Hispanic
 - e. Multiracial
 - f. Other

4. My family lives in a(n)
 - a. Apartment
 - b. House
 - c. Mobile Home

5. My age
 - a. <25
 - b. 25-29
 - c. 30-34
 - d. 35-39
 - e. 40-45
 - f. >45

Appendix B.2. Student Pre and Post-Program Health Habit Survey and Nutrition and Fitness Quiz.

Project FIT Student Questions

A. Survey data. Circle answer.

1. Do you read food labels?
 - a. Always
 - b. Most of the time
 - c. Sometimes
 - d. Rarely
 - e. Never

2. At meals I eat
 - a. Too much
 - b. A little too much
 - c. Just the right amount
 - d. Not enough
 - e. I don't know

3. When it comes to snacks, I eat
 - a. Too much
 - b. A little too many
 - c. Just the right amount
 - d. Hardly any
 - e. I don't eat snacks
 - f. I don't know

4. During the week (school days), how much time do you watch TV?
 - a. I don't watch TV
 - b. Less than 1 hour
 - c. 1 – 2 hours a day
 - d. 3 – 4 hours a day
 - e. more than 4 hours a day

5. During the week, (school day), how many TV shows do you watch?
 - a. I don't watch TV
 - b. 2 – 3 shows
 - c. 4 – 6 shows
 - d. 7 or more shows

6. During one weekday (school day), how many hours do you spend on cell phones, tablets, or the computer?
 - a. I don't use these items.
 - b. Less than 1 hour
 - c. 1 - 2 hours
 - d. 3 - 4 hours
 - e. More than 4 hours
7. During the weekend, how much time do you watch TV?
 - a. I don't watch TV
 - b. Less than 1 hour
 - c. 1 - 2 hours a day
 - d. 3 - 4 hours a day
 - e. more than 4 hours a day
8. During the weekend, how many TV shows do you watch?
 - a. I don't watch TV
 - b. 2 - 3 shows
 - c. 4 - 6 shows
 - d. 7 or more shows
9. During one weekend day, how many hours do you spend on cell phones, tablets, or the computer?
 - a. I don't use these items.
 - b. Less than 1 hour
 - c. 1 - 2 hours
 - d. 3 - 4 hours
 - e. More than 4 hours
10. How much physical activity (exercise or physical work) do you get in a normal day?
 - a. Less than 15 minutes
 - b. 15 - 30 minutes
 - c. 30 - 60 minutes
 - d. More than 60 minutes
11. How many days are you physically active each week?
 - a. 0 - 2 days
 - b. 3 - 4 days
 - c. 5 - 7 days

B. Nutrition quiz. Circle the correct answer(s).

1. How many food groups are shown in MyPlate?
 - a. 6
 - b. 10
 - c. 5
 - d. 1
 - e. I don't know
2. How many cups of fruit should you eat each day?
 - a. None
 - b. 1 or 2
 - c. 3 or more
 - d. I don't know
3. When buying fruit juice, how often is it 100 % fruit juice?
 - a. Almost always
 - b. Sometimes
 - c. Almost never
 - d. I don't know.
 - e. I do not drink juice.
4. About how much of your plate should be fruits and vegetables?
 - a. One quarter
 - b. One half
 - c. Three quarters
 - d. All of it
5. A serving size
 - a. Is the amount in the package.
 - b. Is the amount you eat at one meal.
 - c. Depends on the food and is listed on the label.
 - d. Is different for everyone.
6. A food that is labeled "low fat" always has fewer calories than the regular version
 - a. True
 - b. False
7. Which of the following is the healthiest snack?
 - a. Cookies and milk
 - b. Canned soda and raisins
 - c. Peanut butter on toast and an orange
 - d. Cheese and crackers and fruit punch

8. You should warm up every time you exercise
 - a. True
 - b. False
9. You can get more fit by
 - a. Swinging
 - b. Riding bikes
 - c. Playing video games
 - d. Shopping
10. What is a balanced exercise plan?
 - a. Running, weight lifting, stretching
 - b. Running, weight lifting, tennis
 - c. Running, cycling, tennis
 - d. Weight lifting, hiking, leg lifts

Student data

1. I am
 - a. Male
 - b. Female
2. My family lives in a(n)
 - a. Apartment
 - b. House
 - c. Mobile Home
3. I am
 - a. Black
 - b. White
 - c. Asian
 - d. Hispanic
 - e. Multiracial
 - f. Other

Appendix B.3. Student and Parent Food Frequency Questionnaire.

In the last 24 hours, how many servings did you eat or drink from each of these?

Fruits	0	1	2	3	4	5
Vegetables	0	1	2	3	4	5
Breads, cereals, rice and grain	0	1	2	3	4	5
Meats and other protein foods	0	1	2	3	4	5
Milk, cheese, and other dairy	0	1	2	3	4	5
Sodas	0	1	2	3	4	5
Sports drinks (like Gatorade)	0	1	2	3	4	5
Water	0	1	2	3	4	5
Whole wheat bread, pasta, or cereal	0	1	2	3	4	5
Chips or other salty snack	0	1	2	3	4	5
Cookies, cakes, or other sweets	0	1	2	3	4	5

Appendix B.4. Parent Satisfaction Survey

Project FIT

Parent Satisfaction Survey

Please help us rate the Project FIT program by checking the answer you most agree with.

How satisfied were you with:

	Extremely Satisfied	Satisfied	Neutral	Not Satisfied	Not at all Satisfied
1. The check-in process	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. The staff treated me with respect.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. The staff treated my child with respect.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The staff made my child feel comfortable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. The nutrition information was informative and helpful.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. The exercise information was informative and helpful.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. The exercises were the right level of difficulty for my child.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. The staff explained things to me when needed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. My level of satisfaction with this program	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Cost of the program	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11: Meeting times	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. My child's progress towards fitness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Appendix C.

Fitness Data

Appendix C. Pre and Post Fitness Data

<u>Pre- Rest BP</u>	<u>Post- Rest BP</u>	<u>Pre- Push Up</u>	<u>Post- Push Up</u>	<u>Pre-Sit Up</u>	<u>Post- Sit Up</u>	<u>Pre- Chair Squat</u>	<u>Post- Chair Squat</u>	<u>Pre-Step Test 3 min</u>	<u>Post-Step Test 3 min</u>
135/72	124/73	18	21	46	47	34	34	117	126
127/57	106/48	3	16	43	40	25	28	135	127
124/68	117/60	20	21	32	39	24	32	113	117
106/75	135/80	22	32	42	45	29	32	126	115
118/63	108/55	17	21	37	48	31	37	134	131
99/72	108/56	18	17	42	51	27	32	137	133
106/66	110/58	10	8	38	51	30	39	130	129
95/60	91/52	5	12	28	39	31	37	113	115
117/49	108/50	24	34	44	50	17	44	130	129
120/69	115/66	12	17	42	45	21	22	122	105
n/a	n/a	15	25	37	43	57	51	117	105
96/71	104/61	5	18	29	42	23	28	126	132
97/39	107/88	10	14	46	38	35	29	132	119
96/62	93/55	18	20	46	48	29	39	94	95
113/67	102/66	4	17	39	36	25	26	106	113
116/63	134/76	28	21	43	48	50	41	137	115
Mean		14.31	19.63	39.63	44.38	30.50	34.44	123.06	119.13

Appendix D.
Parent Results of *FIT* Health Habit Survey

Appendix D.1. Parents Results of Pre-FIT Health Habit Survey

	Pre-Program Survey				
	Always	Most of the time	Sometimes	Rarely	Never
Do you read food labels?	6%	44%	44%	0%	6%
At meals I eat	Too much	Little too much	The right amount	Not enough	I don't know
When it comes to snacks I eat	17%	44%	39%	0%	0%
	Too much	Little too many	The right amount	Hardly any	I don't eat snacks
During the week, how much time do you watch TV?	6%	56%	22%	11%	0%
	No TV	Less than 1 hr	1-2 hrs	3-4 hrs	more than 4 hrs
during the week, how many TV shows do you watch?	11%	33%	33%	17%	6%
	No TV	2-3 shows	4-6 shows	6 or more	
During one weekday, how many hours do you spend on cellphones, tablets, computers, etc?	11%	72%	11%	6%	0%
	No Tech	Less than 1 hr	1-2 hrs	3-4 hrs	more than 4 hrs
During the weekend, how much time do you watch TV?	0%	17%	33%	6%	44%
	No TV	Less than 1 hr	1-2 hrs	3-4 hrs	more than 4 hrs
During the weekend, how many TV shows do you watch?	17%	11%	39%	28%	6%
	No Tv	2-3 shows	4-6 shows	7 or more	
During one weekend day, how many hrs do you spend on cellphones, tablets, computers?	22%	50%	28%	0%	
	No Tech	Less than 1 hr	1-2 hrs	3-4 hrs	more than 4 hrs
How much physical activity do you get in a normal day?	0%	6%	56%	11%	28%
	Less than 15 mins	15-30 mins	30-60 mins	more than 60 mins	
How many days are you physically active during the week?	33%	28%	17%	22%	
	0-2 days	3-4 days	5-7 days		
	56%	33%	11%		

Appendix D.2. Parent Results of Post-FIT Health Habit Survey

Do you read food labels?	Always 13%	Most of the time 13%	Sometimes 44%	Rarely 13%	Never 19%	25%
At meals I eat	Too much 0%	Little too much 19%	The right amount 69%	Not enough 6%	I don't know 6%	55%
When it comes to snacks I eat	Too much 0%	Little too many 19%	The right amount 44%	Hardly any 13%	I don't eat snacks 6%	40%
During the week, how much time do you watch TV?	I don't watch TV 13%	Less than 1 hour 38%	1-2 hours per day 31%	3-4 hours per day 19%	More than 4 hours 0%	40%
During the week, how many TV shows do you watch?	I don't watch TV 13%	2-3 shows 69%	4-6 shows 19%	6 or more shows 0%		4%
During one weekday, how many hours do you spend on cellphones, tablets, or the computer?	I don't use these items 6%	Less than 1 hour 38%	1-2 hours per day 31%	2-3 hours 13%	3-4 hours 13%	33%
During the weekend, how much time do you watch TV?	I don't watch TV 19%	Less than 1 hour 19%	1-2 hours 31%	3-4 hours 19%	More than 4 hours 13%	9%
During the weekend, how many TV shows do you watch?	I don't watch TV 19%	2-3 shows 31%	4-6 shows 44%	more than 6 shows 6%		22%
During one weekend day, how many hours do you spend on cellphones, tablets, or the computer?	I don't use these items 0%	Less than 1 hour 25%	1-2 hours 38%	3-4 hours 13%	more than 4 hours 25%	46%
How much physical activity do you get in a normal day?	less than 15 minutes 6%	15-30 minutes 44%	30-60 minutes 19%	more than 60 minutes 31%		4%
How many days are you physically active during the week?	0-2 days 13%	3-4 days 25%	5-7 days 63%			20%

VII. VITA

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EDUCATION

The University of Mississippi Oxford, MS

Master of Science in Food and Nutrition Services May 2016

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DIETETIC INTERNSHIP

Delta State University Cleveland, MS

Coordinated Program in Dietetics (Beginning Aug 2016)

EXPERIENCE

The University of Mississippi Department of Nutrition and Hospitality Management Oxford, MS

Graduate Teaching Assistant 2014-2016

MEMBERSHIPS

- Academy of Nutrition and Dietetics, Member 2012-present
- Student Dietetic Association, Member 2012-2014
- Excel by 5 Health and Safety committee, Member 2014-present
- Sigma Alpha Lambda Honors Organization, Member 2011-present
- National Society of Collegiate Scholars, Member 2011-present