

Fuel For Learning: The Effects of a Childhood Obesity and Stress Prevention Program on
the Parents of Participating Children

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ABSTRACT

Americans are overweight and incredibly stressed and there is no indication of this being reversed. The obesity epidemic in this country continues to escalate rapidly. Both children and adults are suffering the physical and mental effects of this crisis. Fuel For Learning (FFL) is an eight week nutrition and stress prevention intervention targeted primarily at third graders in order to give them the skills necessary to make healthy choices for themselves. The program focuses on nutrition, yoga movement, and stress prevention while meeting selected third grade education standards so that it fits into the school curriculum.. These topics and associated activities are presented in DVD format and classroom teachers function as the program facilitators.

One of the most influential forces in the lives of children is their parents, especially at a young age. Parents who practice good health habits are not only benefiting themselves, but also setting an example for their children. For this reason, it is crucial that both the parents and children be educated about these topics. Parents of participating students were given educational handouts that outline the lesson that the children learned that week along with specific, practical advice for adults.

This study was a non-equivalent, wait list control study. It evaluated the impact that this program had on parents/caregivers' selected food behaviors and dietary habits, stage of change for ten selected health behaviors, and the level of perceived stress.

Demographic data was also collected. Fifty-six parents participated in the study. Parents' food behaviors changed significantly for one of the thirteen selected food behaviors, their stage of change improved significantly for two of the ten selected health behaviors, and there was no observable change in parents' level of perceived stress following the intervention.

CHAPTER 1

Introduction

Obesity and chronic stress are two serious and related health issues in the United States today. Obesity is a growing problem for both children and adults, with dramatic increases occurring over the past 30 years (1). Some of the major health implications of overweight and obesity include hypertension, hypercholesterolemia, and diabetes (2). It is estimated that 300,000 adults die each year due to causes related to overweight and obesity (3). Chronic stress also has negative health consequences, including but not limited to increasing the risk for obesity (4). Forty-three percent of adults experience adverse health effects related to stress (5).

It is evident that major changes need to be made in eating habits and lifestyle behaviors in order to reverse this escalating trend. Changes are necessary for both children and adults in order to address this problem. One avenue to facilitate this change is through the school system. Over 90 percent of children are enrolled in school (6), making schools an ideal location for reaching children. However, parents/caregivers have a significant impact on the eating behaviors of their children, both by controlling the food available at home and by serving as role models of eating behaviors (7). To affect change for both parents and children, nutrition education provided through the school system would be optimal if targeted at both populations.

A partnership between the schools and the parents is one method encouraging change in both the children and adults. However, there are major challenges that need to be overcome. Schools today place a decreased emphasis on nutrition education and stress management (8). They are under a great deal of pressure to assure that children meet academic standards set by federal and state governments in order to continue to receive funding. At the same time, it appears that parents are less able to set a healthy example for their children. In many households today both parents work outside the home. Not surprisingly, time spent on food acquisition and food preparation has decreased in recent years and families have fewer meals together (9). This leads to less time available for parents to set an example of a healthy lifestyle for their children. The increase in households with both parents working outside the home is associated with the increased consumption of fast foods and convenience foods, both of which are contributing factors in the increasing prevalence of obesity (10).

A program that is able to be implemented through the school system while meeting appropriate educational standards, and targets both parents and children may be a viable option for addressing childhood obesity and stress management. The program Fuel For Learning (FFL) is an obesity and stress prevention program that seeks to accomplish these goals. The program is delivered to elementary students via short segments on a DVD that teach healthy behaviors. Weekly newsletters that explain the importance of the lesson, provide practical tips for making lifestyle changes, and discuss the benefits of making these changes are sent home to parents. The goals of the newsletters are to encourage discussion between the parents and children about the

weekly topics, to reinforce the messages for the children and prompt parents to begin to make healthy lifestyle changes.

This study was designed to evaluate the impact of the Fuel For Learning program on parents. Specific objectives of the study include: whether the intervention had an impact on the parents' dietary habits and food choices, stage of change for 10 health behaviors, and perceived stress.

Research hypotheses are:

1. To determine the impact of child participation in Fuel For Learning and parent newsletters on the parents' dietary habits and food behaviors.

H0: There will be no significant changes in the parents' dietary habits and food behaviors for parents who participate in Fuel For Learning as compared to the parents of the wait-list control group.

H1: There will be significant changes in the parents' dietary habits and food behaviors for parents who participate in Fuel For Learning as compared to the parents of the wait-list control group..

2. To determine the impact of child participation in Fuel For Learning and parent newsletters on the parents' stages of change for ten selected health behaviors.

H0: There will be no significant changes in the parents' stages of change for ten selected health behaviors for parents who participate in Fuel For Learning as compared to the parents of the wait-list control group..

H1: There will be significant changes in the parents' stages of change for ten selected health behaviors for parents who participate in Fuel For Learning as compared to the parents of the wait-list control group.

3. To determine the impact of child participation in Fuel For Learning and parent newsletters on the parents' perceived stress.

H0: There will be no significant changes in the parents' perceived stress for parents who participate in Fuel For Learning as compared to the parents of the wait-list control group..

H1: There will be significant changes in the parents' perceived stress for parents who participate in Fuel For Learning as compared to the parents of the wait-list control group..

CHAPTER 2

Review of Literature

Obesity has escalated to the point of becoming a national healthcare crisis in the United States. The rate of obesity in adults has increased rapidly over the past 30 years. Currently 34% of adults in the United States are overweight and another 34% are classified as obese (1). However, perhaps most concerning is the growing trend of childhood obesity. Ten percent of children under age two, twenty percent of children between ages six and eleven, and eighteen percent of children above age eleven are classified as obese (11). There are approximately nine million children nationwide who are considered obese. Although specific subgroups are affected disproportionately, this epidemic has spread to all races, genders, and socioeconomic groups (12). This trend in rapid, dangerous weight gain is alarming due to the numerous negative health consequences associated with overweight and obesity such as diabetes, hypertension, and high cholesterol which may lead to heart disease (2). Data shows that children are developing these diseases that were once considered to be adult onset diseases much earlier in life, which in turn leads to higher stress levels for parents and children as well as an increased burden on the healthcare system. Obesity accounted for \$147 billion in related medical care cost in 2008 alone (13). Childhood obesity is also a risk factor for adult overweight or obesity.

In order to reverse this trend in the United States it is clear that childhood obesity must be addressed. Interventions aimed at improving health behaviors associated with nutrition and stress prevention could help to prevent overweight and obesity. Many previous interventions have had mixed outcomes due to noted limitations in the design, implementation, and evaluation of the programs (14, 15,16). Major issues with design and implementation include a lack of theoretical basis for program development and little description of the necessary training for those implementing the program. Another major criticism of interventions is that their focus has been solely on nutrition information and has not fostered the development of self-efficacy of students in making healthy decisions.

Elementary aged children spend more of their time outside of the home in school than any other location (17, 18). With 52.3 million students enrolled in elementary and secondary schools in 2000, it would seem that schools would be the most appropriate channel for teaching children about making healthy lifestyle decisions (18). However, there are some challenges that must be overcome. One of the greatest challenges that schools face today is the pressure to meet academic standards, especially in the areas of math, science, and reading. This leaves less time in the curriculum for topics such as nutrition education and stress management. These topics are important because they may be associated with lower levels of childhood obesity and thus also with a lower risk for overweight and obesity in adulthood (22). Another potential barrier is that despite the fact that teachers feel that nutrition education is important for their students to learn, many do not feel prepared to teach this topic.

While children spend a great deal of time at school, elementary age children still spend the majority of their time in their own home. This means that the opportunity for

their parents to impact their behaviors is enormous. Although there are relatively few studies that examine the effect of family involvement on weight control, those that have been done suggest that parental involvement is important in helping children to lose weight (21). Other studies have demonstrated the importance of the role that parents or caregivers play in the food choices and eating behaviors of children. Primarily, the parent/caregiver is the one who controls what food is brought into the home, and therefore what is available to the rest of the family (19). Additionally, their eating behaviors serve as a model for the children's eating behaviors (7). Strong links have been established between the food choices of the parents and their children throughout the lifespan, even once the child is independent and has control of their own food choices. This data suggests that parents' dedication to a healthy lifestyle is crucial for helping children to develop in a healthy manner by modeling health behaviors to their children and exposing them to a variety of healthy foods.

Greenburg, et al examined the relationship between the healthy behaviors of mothers and their children. These behaviors included physical activity and healthy food habits. This study demonstrated that for each healthy behavior reported by the mother, the likelihood of that healthy behavior being reported by the child was significantly higher (20).

Some of the most effective school based interventions targeting the prevention of overweight and obesity have included some type of parental involvement. One school based intervention, the Hip-Hop to Health Jr. program aimed to target overweight and obesity prevention in three to five year old minority children. The curriculum included dietary changes and physical activity for the children as well as a parental component.

The parental intervention included a weekly newsletter consistent with the children's weekly lesson as well as brief homework assignments meant to reinforce the messages from the newsletters. In the two year follow up study the treatment group was found to have significantly smaller increases in the body mass index than the control group (21).

Another study that demonstrates the influence of the family in interventions is the Child and Adolescent Trial for Cardiovascular Health (CATCH). This intervention was also implemented through schools and the in-classroom curricula focused on changing children's dietary and physical activity knowledge, attitudes, and self-reported behaviors. The primary parental involvement in this trial was a packet of skill building activities that the parents and children were to complete together, which reinforced the messages that the children learned in school (21). Parents have a significant impact on their children's food choices, the quality of the diet, and therefore the risk for overweight and obesity. However, a lack of nutrition education and self-efficacy in the skills needed to make healthy choices may be a major barrier for parents attempting to provide a healthy example for children to follow.

In addition to nutrition behaviors, stress is also linked to overweight and obesity. One way this is manifested is through comfort eating. During times of stress, individuals often eat calorically dense "comfort foods". Ulrich-Lai, et al showed that the intake of sucrose, a component of many comfort foods, reduces neuroendocrine, cardiovascular, and behavioral responses to stress in rats (23). Large portions of calorically dense foods such as these comfort foods are a contributing factor to the obesity epidemic (24). Another way in which stress may contribute to obesity is through stress hormones. Glucocorticoids can produce insulin insensitivity, which leads to problems such as

hypercholesterolemia and decreased energy expenditure. This combination may promote weight gain and obesity in individuals (24).

Epel, et al studied another way that stress affects health. This study examined the effect of stress-induced cortisol and eating behaviors in women. Stress stimulates the release of endogenous cortisol, which they hypothesized may lead to stress induced eating. Their study found that women who had a higher cortisol response to stress consumed more calories in comparison to those who had a low cortisol response to stress on the days when they were exposed to new stressors. However, they had similar calorie consumptions on control days. Another factor that was related to increased calorie consumption was negative mood. The results from this study suggest that the stress response may influence eating behavior, which in turn can impact weight and health (25).

Other studies have examined the role which stress plays in inflammation and other aspects of health. One study showed that stimulation of stress hormones such as norepinephrine significantly increased the interleukin-6 secretion (26). This finding has major health implications. Specifically, circulating interleukin-6 stimulates the activation of the hypothalamic-pituitary-adrenal axis. The activation of this area of the brain is associated with central obesity, hypertension, and insulin resistance (27). This is another example that points to the theory that decreasing stress might be beneficial in reducing the risk for certain health problems, including obesity.

CHAPTER 3

Methodology

Research Design

A quasi-experimental non-equivalent wait list control group design was used in six classrooms in two preselected schools in Columbus, Ohio. Two different schools were recruited for participation. The protocol was approved by the Institutional Review Board (IRB) for social and behavioral human subject research on November, 2010 and all researchers and research assistants were CITI trained.

Sample

Four third grade classrooms in Hilliard Beacon Elementary and two third grade classrooms in Immaculate Conception School chose to participate. Parents of children participating in Fuel For Learning were recruited for this study. Those who provided informed consent completed surveys pre/postpre/post treatment. Participation in the program was strictly voluntary for parents/caregivers as well as for children.

Instrumentation

Variables being measured for parents/caregivers were self-reported stages of change, food behaviors, and perceived stress. Demographic information including gender, age, and ethnicity was also collected.

The *Food Behavior Checklist* was administered pre/post program implementation. It is a 22 item brief checklist designed for administration to adults. This checklist measures fruit and vegetables consumption, milk consumption, fat and cholesterol consumption, and dietary behaviors such as use of the food label and frequency of eating away from home. Responses categories are either dichotomous (Yes/No) or frequency based (0-5). Items eleven through sixteen and twenty through twenty-two were excluded from analysis because the intervention did not address these behaviors.

The *Stages of Change* questionnaire was administered pre/post program implementation as well. The questionnaire consists of 10 survey questions based on the Transtheoretical Model. The questions are based on the primary target behaviors of the program. Target behaviors included: eating lower calorie snack foods, eating only one serving from a larger box or bag of packaged snack foods, drinking drinks without added sugar, eating three servings of fruits every day, eating three servings of vegetables every day, eating three servings from the dairy group every day, eating cereals low in sugar, eating breakfast every day, managing stress, and realizing the things and people in life that help keep them healthy and happy. There were five possible responses that correspond to one of the five stages of change according to this model. The responses included “I don’t and don’t plan to anytime soon” (Pre-contemplation), “I don’t, but think

I should” (Contemplation), “I don’t usually, but I’m going to start soon” (Preparation), “I just started to” (Action) and “I usually do” (Maintenance).

The *Perceived Stress Scale*, developed by Cohen et. al is the most widely used psychological instrument for measuring the perception of stress. This instrument includes ten questions designed to measure the degree to which situations in life are perceived as stressful by the parent/caregiver. The items evaluate how overloaded, unpredictable and uncontrollable the parent/caregiver finds his or her life. It also evaluates their current levels of experienced stress.

Demographic information was collected using a parent information form. Parent/caregiver birth date, age, gender, ethnicity, and relationship to child was collected using this form.

Methods

Parents of children participating in Fuel For Learning were recruited for participation in this study. A packet of information was sent home to parents/caregivers of children participating in the program in December, 2010. Included in the packet was a letter explaining the program, consent to participate form, and a parent information form. The data was returned to teachers in the participating classrooms in sealed envelopes that were picked up by the researchers. Participants were identified only by participant identification numbers. Only data from parents who returned their consent forms was used in this study.

Pre-testing assessments (the *Food Behavior Checklist*, *Stage of Change* questionnaire, and *Perceived Stress Survey*) for parents who gave consent were sent

home with the children the week of January, 2011 before the program began. Parents were asked to return the completed assessments by Friday, January 4, 2011.

The classrooms were assigned to either the treatment or control groups following administrative requests at participating schools. The program began in the treatment classrooms on Tuesday, January 18, 2011 and ended Friday, March 11, 2011. The control group continued with normal classroom activities during this time.

On Friday, March 11, 2011 post-tests were sent home to parents who provided consent. The parents were asked to return completed assessments by Friday, March 18, 2011. Once post-testing was completed on Monday, March 21, 2011 the treatment group resumed their normal classroom activities and the control group began the 8 week program, which concluded for them on Friday, May 20, 2011.

Internal Validity

In order to address the potential threats to internal validity such as history, maturation, and testing, wait list control groups were included in this study. The *Food Behavior Checklist* assessment tool has been found to have suitable validity and reliability (29).

Statistical Analysis

Statistical analyses were conducted using the Minitab 16 Statistical Analysis Software. Each assessment tool was evaluated independently. The normality of the distribution was checked using residual plots. An analysis of variance between pre and post-test scores was conducted to determine statistical significance between scores. The

distribution of data from *Food Behavior Checklist* was normal, therefore two-sample t-tests were used to evaluate whether there was a significant difference between the change scores for the treatment and control groups for each question. The distribution of data from the *Stages of Change* questionnaire and *Perceived Stress Survey* was not normally distributed, therefore the Mann-Whitney nonparametric test was used to evaluate whether there was a significant difference between the change scores for the treatment and control groups. A p value of $<.05$ was used to determine statistical significance.

For the *Food Behavior Checklist* each of the questions one through ten and seventeen through nineteen were evaluated independently. The yes/no questions were scored as one or zero, with one always representing the desired response. The categorical response questions were assigned a score from zero to four, with four being the desired response. To determine if significant differences existed between treatment and control groups, change scores were calculated by subtracting the pre score from the post score.

For the *Stages of Change* questionnaire each of the ten questions was evaluated independently. Each response was scored on a scale of zero to four, with four being the desired response. To determine if significant differences existed between treatment and control groups, change scores were calculated by subtracting the pre score from the post score.

For the *Perceived Stress Survey* each response was scored on a scale from zero to four, with zero being the desired response. Each respondent's total score was found by summing their responses from each of the ten questions. This was done for both the pre score and post score. Four items were reversed scored. To determine if a significant

difference existed between the treatment and control groups, change scores were calculated by subtracting the post score from the pre score.

CHAPTER 4

Results

A total of fifty-six parents/caregivers chose to participate in the study. The response rate of the study was sixty-one percent. There were thirty-one participants in the treatment group and twenty-six participants in the wait-list control group.

Demographics

The demographic variables collected were age, ethnicity, and relationship to child participating in Fuel For Learning. The mean age of participants in the treatment group was thirty-nine. All thirty-one participants in the treatment group identified their ethnicity as white and the relationship to the child as being their parent. There were twenty-eight females and three males in the control group. The mean age of participants in the treatment group was forty-one. Twenty-one of the participants in the control group identified their ethnicity as white, three identified as Asian, and two identified as Hispanic (Figure 1).

Summary of Demographic Information

	Treatment	Control
Male	3	4
Female	28	22
Mean Age	39	41
Asian	0	3
Black/African American	0	0
Hispanic	0	2
White	31	21

Figure 1

Food Behavior Checklist

The only question that showed a statistically significant difference in change scores between the treatment and control groups was question ten, during the past week, did you have milk as a beverage or on cereal. The difference in change scores for the other questions was not statistically significant (Figure 2).

Food Behavior Checklist				
	Mean Change Score for Treatment	Mean Change Score for Control	p-value	
1)more than 1 fruit	0.097	0.08	0.876	
2)citrus fruit	-0.097	-0.24	0.209	
3)more than 1 veg	0.065	0.12	0.665	
4)servings of veg	0	0.2	0.324	
5)2 or more veg	0.097	0.04	0.69	
6)fruit/veg snacks	-0.032	0	0.796	
7)servings of fruit	0	0.04	0.855	
8)raw veg	-0.065	0	0.591	
9)drink milk daily	0.032	0.12	0.523	
10)milk on cereal	-0.097	0.12	0.042	
17)use nutrition label	0.032	0.04	0.0945	
18)reg soft drinks	0.097	0.04	0.177	
19)kool-aid, gatorade	0	0	1	

Figure 2

Stages of Change

There were two questions that showed a statistically significant difference in change scores between the treatment and control groups on the *Stages of Change* questionnaire. The two questions were question number two, I eat only one serving from a large bag or box of packaged food, and question number 3, and I drink drinks without added sugar. The difference in change scores for the other questions was not statistically significant (Figure 3).

	Stages of Change Median Change Score for Treatment	Median Change Score for Control	p- value
1) low cal snack	0	0	0.9923
2) 1 serving	0	0	0.0381
3) drink w/o added sugar	0	0	0.0099
4)3 servings fruit	0	0	1
5)3 servings veg	0	0	0.8561
6)3 servings dairy	0	0	0.4494
7)low sugar cereal	0	0	0.3869
8)breakfast	0	0	0.1325
9)manage stress	0	0	0.5952
10)who makes you happy	0	0	0.6444

Figure 3

Perceived Stress Scale

The difference between the change scores for the treatment and control groups was not statistically significant at $p=.4974$. The median change score for the treatment group was -1 and the median change score for the control group was zero (Figure 4).

Perceived Stress Score

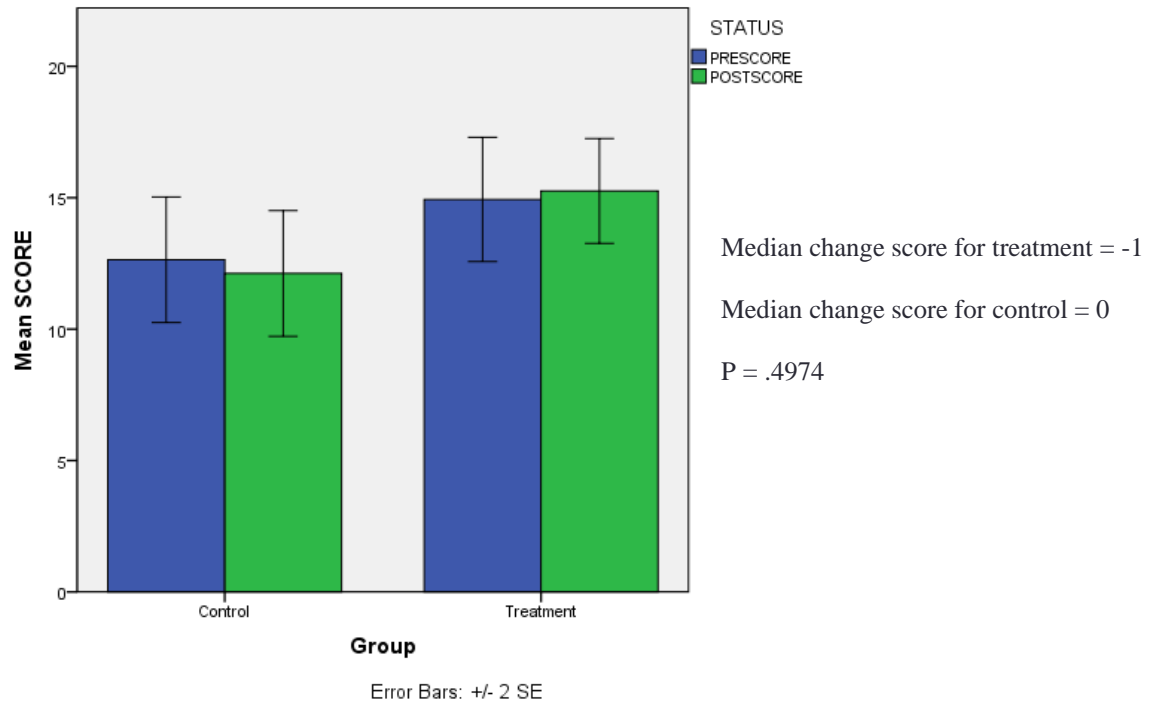


Figure 4

CHAPTER 5

Discussion

It is important to note that the similarities in the demographic data for the treatment and control groups means that the demographic information did not play a large role in the differences found between change scores for the two groups. However, it is also important to note that this sample is not representative of the population as a whole. Therefore, these results may be more difficult to generalize to more ethnically diverse populations. The study was also conducted over a short period of time, which limits the ability to see long term changes.

In this study, the demographic variables indicated that most of the parents of third graders were white, near age forty, and those who most commonly chose to participate were female. This is not necessarily true of the general public and differences would likely be seen in different school districts and areas of the country. In a larger sample size these differences would be reflected and the demographic variables treated as covariates.

There are several additional possible explanations for the results found after completion of this study. In the *Food Behavior Checklist*, the only question that showed any statistically significant change was whether the participant had consumed milk as a beverage or on cereal in the last week. This is a relatively easy and small change to make, since participants would only have to consume one serving of milk in a week in order to show change for this question.

In the *Stages of Change* questionnaire, there are also several possible explanations for the changes that were seen. First, even if some of the participants moved up from one of the first three stages (precontemplation, contemplation, and preparation), they would need to have improved to the action stage for any changes to be seen using the *Food Behavior Checklist*. This intervention may not have taken place over a long enough period of time for participants in the early stages to move all the way to the action stage. Also, the two questions that did show improvement on the *Stages of Change* questionnaire were behaviors that were addressed near the beginning of the program, which could imply one of two things. It may be that participants paid more attention to the program early on and became overwhelmed or too busy to pay attention to the materials sent home by the end of the program, or it may be that those were the behaviors that they had sufficient time to change because those behaviors were introduced several weeks prior to the post intervention assessments. These behaviors also required that the participants make fewer changes in their lifestyle in order to show improvement. It may be simpler for participants to not drink drinks with added sugar than to improve their vegetable consumption from zero vegetables per day all the way to three servings of vegetables per day. In this instance, a smaller improvement would not be picked up by the assessment tools that were used.

The fact that the *Perceived Stress Survey* scores did not change is not surprising upon learning anecdotally that many of the parents did not read or participate in the yoga movement component of the program. Since this is the piece of the program that was expected to reduce perceived stress, parents who did not participate in that component would not be expected to see any improvement in that area.

Limitations

The Fuel For Learning program was designed primarily to effect changes in children's behavior. The parent intervention was secondary to the in-classroom intervention for children. The parent intervention (newsletters) was designed to support children's learning at home and foster discussion between parents and children regarding the weekly lessons. Parent newsletters may have been successful in creating awareness but not sufficient to initiate significant behavior change.

Parents may not have read all of the material sent home. An evaluation of number of newsletters read (dose) was not conducted. Also, parents may not have received the newsletter. We learned anecdotally that this was so for one parent, which was confirmed by the child. Additionally, those who received the newsletters may not have had time to read all the materials.

All assessments were self-reported and used Likert scales at least for part of the assessment. There are several problems associated with Likert scales. The first is the central tendency bias, which means that when filling out Likert scales respondents tend to respond in the middle of the scale rather than the extreme ends, which makes it difficult to measure changes. Using a four point scale rather than a five point scale is one way to combat this so that respondents are forced to make a choice. Another reason that data collected through the use of Likert scales might be distorted is the acquiescence bias, which is the tendency to agree with statements as they are presented. Finally, a problem with all self reported assessments is the social desirability bias, which is the tendency that

people have to try to portray themselves favorably. These tendencies make it less likely to see statistically significant changes (30).

Finally, a small sample size ($n=56$) also may have precluded detecting significant differences. A small sample size in a study may mean a lack of precision to generate reliable answers to the research questions being investigated. Additionally, the larger the sample size, the smaller the sampling error tends to be (29).

Implications for Future Research

A higher level of parental involvement may bring about greater change. Future research could include the development a parent component aimed at effectively engaging parents. For example, something similar the weekly homework assignments and skill building activities that parents and children completed together in both the Hip Hop to Health Jr. program and CATCH interventions may increase the level of engagement of the parents. Another way to engage parents and children in the future would be to hold family nights at the schools where the nutrition education and stress management messages are reinforced and parents and children could complete skill building activities together. Focus groups could be held with parents in order to determine the best and most practical methods for actively involving parents in future interventions. Future research could also include an online component that would ensure that parents read the materials and would eliminate the risk of materials not being received by the parents. It may also be helpful to increase sample size in subsequent investigations in order to reduce the sampling error.

CHAPTER 6

Conclusion

The intervention significantly impacted the food behavior of participants for one of the thirteen selected food behaviors that were evaluated. Question ten, during the past week, did you have milk as a beverage or on a cereal, was the only question from the *Food Behavior Checklist* that showed a significant difference between the treatment and control groups after the completion of treatment. For question ten, the alternative hypothesis that there will be significant changes in the parents' dietary habits and food behaviors for parents who participate in Fuel For Learning is accepted. The null hypothesis, that there will be no significant changes in the parents' dietary habits and food behaviors for parents who participate in Fuel For Learning, is accepted for the other questions from the *Food Behavior Checklist*.

The intervention significantly impacted the stage of change of participants for two of the ten questions on the *Stages of Change* questionnaire. Question two, I eat only 1 serving from a large bag or box of packaged food, and question three, I drink drinks without added sugar, were the only questions from the *Stages of Change* questionnaire that showed a significant difference between the treatment and control groups following the completion of the treatment. The alternative hypothesis, that there will be significant changes in the parents' stages of change for selected health behaviors for parents who participate in Fuel For Learning, is accepted for these two questions. The null hypothesis,

that there will be no significant changes in the parents' stages of change for selected health behaviors for parents who participate in Fuel For Learning, is accepted for the other questions.

The intervention does not appear to have significantly impacted the perceived stress of participants. In this case, the null hypothesis, that there will be no significant changes in the parents' perceived stress for parents who participate in Fuel For Learning, is accepted.

LIST OF REFERENCES

1. Prevalence of overweight, obesity and extreme obesity among adults: United States, trends 1960-62 through 2005-06 [homepage on the Internet]. Atlanta, GA: Center for Disease Control. 2010 January 27 [cited February 9, 2011]. Available from: http://www.cdc.gov/nchs/data/hestat/overweight/overweight_adult.htm.
2. Van Itallie TB. Health Implications of Overweight and Obesity in the United States. *Annals of Internal Medicine*. 1985 December 1; 103:983-988.
3. Mokad AH, Serdula MK, Dietz WH, Bowman BA, Marks JS, Koplan JP. The Continuing Epidemic of Obesity in the United States. *J Am Diet Assoc*. 2000; 284(13):1650-1651.
4. Dallman MF, Pecoraro N, Akana SF, la Fleur SE, Gomez F, Houshyar H, Bell ME, Bhatnagar S, Laugero KD, Manelo S. Chronic stress and obesity: A new view of “comfort food”. *PNAS*. 2003 September 30; 100:11696-11701.
5. Chakraborty A. The Effects of Stress on Your Body. [homepage on the Internet]. WebMD. 2010 March 8 [cited February 12, 2011]. Available from: <http://www.webmd.com/balance/guide/effects-of-stress-on-your-body>
6. School Enrollment in the United States-Social and Economic Characteristics of Students. [homepage on the Internet]. US Census Bureau. [cited February 19, 2011]. Available from <http://www.census.gov/prod/2001pubs/p20-533.pdf>.
7. Savage JS, Fisher JO, Birch LL. Parental influence on eating behavior: conception to adolescence. *J Law Med Ethics*. 2007;35:22-34.
8. Stein K. Nutrition quality and education in K-12 schools. *J Am Diet Assoc*. 2005;105:334-336.
9. Herbert SK. The Changing American Family. *Hoover Digest*. 2004 July 30; 3.

10. Incorporating Away-From-Home Food into a Healthy Eating Plan. [homepage on the Internet]. Center for Disease Control. [cited February 12, 2011]. Available from:
http://www.cdc.gov/nccdphp/dnpa/nutrition/pdf/r2p_away_from_home_food.pdf .
11. Ogden C, Carroll M. Prevalence of Overweight and Obesity Among Adolescents: United States Trends 1963-1965 Through 2007-2008. [homepage on the internet]. Center for Disease Control. 2010 June. [cited February 12, 2011]. Available from
http://www.cdc.gov/nchs/data/hestat/obesity_child_07_08/obesity_child_07_08.pdf .
12. Institute of Medicine. Preventing Childhood Obesity-Health in the Balance. Washington, DC: *The National Academies Press*; 2005.
13. Economic Consequences. [homepage on the Internet]. Center for Disease Control. [cited February 12, 2010]. Available from
<http://www.cdc.gov/obesity/causes/economics.html> .
14. Stevens J, Taber DR, Murray DM, Ward DS. Advances and controversies in the design of obesity prevention trials. *Obesity*. 2007;15:2163-2170.
15. Baranowski T, Cullen KW, Baranowski J. Psychosocial correlates of dietary intake; advancing dietary intervention. *Annu Rev Nutr*. 1999; 19: 17-40.
16. Bandura A. Health promotion by social cognitive means. *Health Education and Behavior*. 2004; 31:143-164.
17. Institute of Medicine. Preventing Childhood Obesity-Health in the Balance. Washington, DC: *The National Academies Press*; 2005.
18. U.S. Department of Education. Projections of Education Statistics to 2012. National Center for Education Statistics Report 2002-030. Washington, DC: U.S. Department of Education. <http://nces.ed.gov/pubs2002/2002030.pdf>.
[2002](http://nces.ed.gov/pubs2002/2002030.pdf).
19. Savage JS, Fisher JO, Birch LL. Parental influence on eating behavior: conception to adolescence. *J Law Med Ethics*. 2007;35:22-34.
20. Greenberg RS, Ariza AJ, Binns HJ. Activities and Dietary Habits of Mothers and Children: Close Ties. *Clin Pediatr*. 2010 August 19; 49:1026-1032.

21. Lindsay AC, Sussner KM, Kim J, Gortmaker S. The Role of Parents in Preventing Childhood Obesity. *Childhood Obesity*. Spring 2006; 16:1.
22. Childhood Obesity. [homepage on the Internet]. Center for Disease Control. [cited February 19, 2011]. Available from: <http://www.cdc.gov/healthyyouth/obesity/>
23. Ulrich-Lai YM, Christiansen AM, Ostrander MM, Jones AA, Jones KR, Choi DC, Krause EG, Evanson NK, Furay AR, Davis JF, Solomon MB, de Kloet AD, Tamashiro KL, Sakai RR, Seeley RJ, Woods SC, Herman JP. Pleasurable behaviors reduce stress via brain reward pathways. *PNAS*. 2010 November 23; 107:20529-20534.
24. Brindley DN, Rolland Y. Possible connection between stress, diabetes, hypertension and altered lipoprotein metabolism that may result in atherosclerosis. *Clin Sci (Lond)*. 1989 November; 77(5):453-461.
25. Epel E, Lapidus R, McEwen B, Brownell K. Stress may add bite to appetite in women: a laboratory study of stress-induced cortisol and eating behavior. *Psychoneuroimmunology*. 2001 January; 26(1): 37-49.
26. Nilsson MB, Sood AK. Stress hormones stimulate secretion of interleukin-6 by human ovarian carcinoma cell lines. *Proc Amer Assoc Cancer Res*. 2004; 45.
27. Yudkin JS, Kumari M, Humpries SE, Mohamed-Ali V. Inflammation, obesity, stress and coronary heart disease: is interleukin-6 the link? *Atherosclerosis*. 2001 February 1; 148(2): 209-214.
28. Branscum P, Sharma M, Succop P, Kaye G. An Evaluation of the Validity and Reliability of a Food Behavior Checklist Modified for Children. *J Nutr Educ Behav*. 2010;42:349-352.
29. Power Analysis. [homepage on the internet]. StatSoft Electronic Statistics Textbook. [cited May 24, 2011]. Available from <http://www.statsoft.com/textbook/power-analysis/>.
30. How to use the Lickert Scale in Statistical Analysis. [homepage on the internet]. Statistics Café. [cited May 24, 2011]. Available from <http://statisticscafe.blogspot.com/2011/05/how-to-use-likert-scale-in-statistical.html>.

