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AN ANALYSIS OF THE EFFICACY OF THE HEALTHY BODIES PROJECT ON INCREASING FOOD LITERACY IN PRESCHOOL CHILDREN

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ABSTRACT

The goal of the Healthy Bodies Project is to reduce rates of childhood obesity. The project aims to achieve this through a nutrition intervention targeted at 3-5-year-old low-income preschool children in Central Pennsylvania. This 28-week intervention works to increase the children's food literacy and willingness to try new foods. This study measured improvements in food literacy over the course of the program through food literacy assessments that were conducted at the beginning and end of the program during the 2015-2016 school year. Trained research assistants conducted the assessments during one visit per classroom for pre-assessments, and one visit for post-assessments. Descriptive statistics were also generated to see if there was a relationship between how much a score increased in a classroom and the frequency with which a teacher used the supplied and recommended lesson tools, which included a mystery bag, flashcards, a song, and supplementary activities. Overall, there was a statistically significant improvement in food literacy scores after the program. The results indicate that greater use of the learning tools was not significantly related to the increase in children's food literacy.

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Chapter 1

Literature Review

Childhood Obesity as a Growing Health Concern

Among children aged 2-5 years in the U.S., the prevalence of obesity was 9.4% in 2013-2014. Obesity in children is defined as a BMI value greater than or equal to the 95th percentile on the US Centers for Disease Control and Prevention (CDC) BMI-for-age-growth charts. Childhood obesity rose at an alarming rate from the 1970s to the early 2000s, but has plateaued in the last decade. (Carrol et al, 2016). While this is promising in that it has not continued to rise, the obesity crisis is still the worse it has ever been. There are now at least 1 in 5 children who are considered obese in the United States, reaching epidemic proportions (Dietz, 1998). In 2001, public policy makers marked childhood obesity as a major public health concern. In 2008, it was estimated that this issue is costing the United States $254 billion per year when taking both direct health care costs and lost productivity into consideration (Guadagno, Rowland, Toumbourou, & Tso, 2017).

There are both short and long-term health consequences linked to childhood obesity. Many of the short-term health consequences are predictors of more serious health complications that often show up in adulthood. Some of these include hyperlipidemia, hypertension, and abnormal glucose tolerance, which are indicative of developing metabolic syndrome. Children who are obese may also have sleep apnea, advanced bone age, orthopedic complications,

polycystic ovary disease, and fatty liver (Dietz 1998; Antoinette & Nathan, 2008). There is also a positive correlation between childhood obesity and obesity in adulthood (Byers et al., 1993).

Though obesity contributes to many physical health problems, both short and long-term, the most prominent acute consequences of childhood obesity are psychosocial. Obesity is linked to behavioral issues such as aggression in young children. In a systematic review of 23 studies that included a total of 255,377 participants, physical aggression was identified to be a more prominent trait in overweight in obese and overweight children in comparison to their normal weight peers, and slightly more prominent in boys than girls. Childhood aggression can be a precursor for later involvement in criminal behavior, as well as mental health disorders related to mood and anxiety. There is some dispute over the causes of this relationship between aggression and obesity. Proposed theories attribute both aggression and obesity to the influence of socioeconomic status, self-regulation problems, mental health problems, and peer rejection (Guadagno, Rowland, Tounbourou, & Tso, 2017). In addition, by the time children reach adolescence, they have been socialized to associate overweight with traits such as laziness, sloppiness, and an overall lack of desirability as a friend (Dietz, 2008). This is especially true for females. Obesity in adolescent females is linked to lower social status and an increase in depressive symptoms into young adulthood (Merten, Wickrama, & Williams, 2008). Personally-mediated, individual, and institutionalized discrimination affect overweight people from a young age and continue to impact them throughout their lives (Dietz, 2008).

Influence of Environment on Obesity in the US

The growing obesity epidemic is no coincidence. Though humans exhibit natural differences in height and weight, the rapid weight gain seen by a large part of the population in the past few decades is due to factors beyond biology. Following the framework of the bioecological model, it is clear that an individual is influenced at several levels. The four properties of the bioecological model are process, person, context, and time. The interactions between people and their environment over time has led to an obesity epidemic that is extremely complex in nature (Bronfenbrenner & Morris, 2006).

Specifically concerning preschool children, the family, school, and community all impact their likelihood of developing overweight. A contextual model paper took these factors into account, and concluded that future research and interventions much adapt a broader lens and consider all of these factors when approaching the issue of childhood obesity. This will lead to more comprehensive and effective interventions. (Birch & Davison, 2001). The influence of the current lifestyle environment in the United States has undeniably had an impact on the rise in obesity. The reduction of physical activity, as well as the increased availability of calorically dense and palatable foods has caused a tendency towards weight gain. The reduction of physical activity is caused by a shift from labor-focused jobs to corporate desk jobs, as well as increased leisure time spent doing sedentary activities such as watching television and using the computer (Hill, Peters, Reed, & Wyatt, 2003).

The presence of food deserts can also have a major impact on access to healthy food. A food desert is defined as an area where access to healthy food is limited, usually due to a lack of a convenient supermarket. Convenience stores and fast-food chains that offer more locations become the primary food source for families, and they are full of calorically-dense and

nutritionally deficient options (Burke, Keane, & Walker, 2010). Though these options are obviously less healthy, the cost and travel distance to nutritious food is simply not a feasible option for many families. This is a clear example of a societal contribution to the obesity epidemic. Parents are not ignorant to the drawbacks of the food sources they use; studies have found that parents are generally aware of what is considered healthy, but families can sometimes be forced to travel up to 80 miles for good, quality food. This likely contributes to the higher rates of childhood obesity among rural youth, although food deserts do occur in high frequencies in inner cities as well (Fox, Hartley, Leighton, & Yousefian 2011).

Parental Impact on Children's Eating Behaviors

Parents and the food environment they provide at home have an important influence on the eating behaviors of children. One study found a correlation between messages and encouragement 3 to 3.5 year old children received from their parents regarding healthy eating and the amount of nutritional knowledge the children possessed (Anliker, Beal, Laus, & Samonds, 1990). Familial patterns of obesity are likely due to an interaction of genetics and the 'obesigenic' environment the parents provide for their children, which is described as an environment where there is an emphasis on teaching children to prefer calorically-dense, high fat foods through repeated exposure. Humans are not born with many specific flavor and taste preferences; many of these are learned through experience (Birch 1998). The basic reflexive responses to food include a preference for salty and sweet, a distaste for sour and bitter, and the initial rejection of new foods (Birch 1999). It was determined that repeated exposure is all that is necessary to shift the response from rejection of a new food to acceptance, thus an intervention

that involves repeated exposure to new foods would be beneficial to increasing a child's willingness to try new foods.

Parents can also have a large impact on a child's ability to self-regulate their energy consumption. Particularly in the first 5 years of life, eating behaviors that serve as a foundation for the future are developed. Children with parents who control their food intake performed the worst in an experiment that measured their ability to balance their energy intake. This is due to a refocusing of the children from their own internal cues of hunger and satiety and towards external factors such as "cleaning their plate" or eating palatable food as a reward (Birch, 1998; Birch, Fisher, & Savage, 2007: Brown & Ogden, 2004). A childhood obesity intervention should take into account parent involvement in this process of shaping a child's dietary behaviors and attitudes.

Food Literacy as a Predictor of Eating Behaviors

General attitudes and beliefs surrounding food strongly influence what people eat. One study found that a higher score on a nutritional knowledge assessment was positively associated with subjects consuming larger amounts of fruits and vegetables. They administered this assessment to a sample representative of the general population. They reported many misconceptions in the general population surrounding healthy food, and more misconceptions was positively correlated with poorer eating habits (Dickson-Spillman & Siegrist, 2011). Another study focused on assessing the food knowledge of preschool children between the ages of 3 ½ to 3 ¾ years. The subjects had a strong level of knowledge concerning food groups, food transformations, food origins, and energy balance. They were able to select foods with higher

energy density as ones that would have a larger impact on strength and growth (Anliker, Beal, Laus, & Samonds, 1990).

An additional study investigated branding and advertising in relation to children's food knowledge and preferences. Advertising for sugary and calorically-dense foods targeted at children has been criticized as playing a role in the current obesity epidemic. While the study discovered that children were readily able to recognize popular brands, there was not a significant correlation between this recognition and eating behaviors (Adab, Kopelman, & Roberts, 2007). A systematic review of the impact of food and beverage marketing on children did discover a relationship between both marketing and food knowledge and marketing and eating behaviors. This review is the most comprehensive one to date, and it highly recommended further investigation into potential policies that could be implemented to halt the negative impact of food advertisements on children (Angus, Cairns, Caraher, & Hastings 2013).

Nutritional Status of Preschool Age Children

The food environment in the United States often leads to nutritional deficiencies in addition to overconsumption. In addition to monitoring general caloric intake, it is also necessary to ensure that children are receiving adequate nutrient intake. Nutritional analyses were performed on the Feeding Infants and Toddlers (FITS) 2008 study, in which 3,273 US infants, toddler, and preschoolers were surveyed. It was discovered that in the preschool age subset of this group, there was a deficiency in vitamin E, potassium, and dietary fiber. There was an overconsumption of vitamin A, zinc, sodium, and saturated fat (Briefel et. al., 2010). An additional literature took a more global perspective, including 5 studies with 6,756 toddlers from

several countries of varying degrees of socioeconomic development. Using national surveys that reported mean nutrient intake, they discovered that there is a global deficiency in Vitamins A, D, E, and calcium (Carvalho at. al., 2015).

Micronutrient issues accrue as a result of inadequate fruit and vegetable intake. As early as 9 to 11 months, children begin consuming calorically dense and nutritionally deficient items such as sugar-sweetened beverages (SSBs) and salty snacks in place of fruits and vegetables. Studies have found that consumption of SSBs is positively associated with obesity. For each serving of SSB consumed, BMI and frequency of obesity both increased (Briefel et. al., 2010; Gortmaker, Ludwig, & Peterson, 2001). The American Heart Association has identified SSBs as the primary source of added sugar in the American diet. They are calorically dense, palatable, and do little to alleviate hunger. Thus, it is incredibly easy to overconsume calories when adding these to a diet (Bray et. al., 2010). These studies indicate a need for food literacy interventions that focus on the nutritional content of food. While BMI is a result of energy in versus energy out, there are often comorbid nutritional issues that accompany obesity. The calorically-dense foods causing this epidemic are low in vitamins and minerals, compounding their negative impact.

Early Childhood Interventions as a Means of Combatting Obesity

Nutritional interventions represent a large part of the effort to reduce childhood obesity in the US. Schools are considered effective settings for nutritional interventions. It is possible to reach children at every stage of development while they are honing eating habits that will persist throughout their lifetime. It is also an excellent venue from which to reach an entire community

(Aldinger & Jones, 1998). Following a long-term investigation into weight patterns, it was determined that obesity interventions prior to puberty were effective in long-term weight maintenance (de Zwann et. al., 2015).

The Department of Home Economics at California State University developed an early childhood nutrition program that included recipes and materials for the classroom activities. Their data from pre and post assessments proved that food literacy increased in the children. Teachers reacted positively to the program, which likely contributed to its success. (Clark & Gorelick, 1985). Another study looked at the differences in outcomes of food knowledge improvements using two different teaching strategies in a food knowledge intervention. It was discovered that a teaching strategy that emphasized the benefit and appeal of fruits and vegetables was more effective than a teaching strategy that used a more threatening approach to coax children to eat vegetables by educating them on negative effects of a poor diet, such as disease (Lawatsch, 1990). These results encourage using a positive approach in current and future interventions.

The Healthy Bodies Project

The Healthy Bodies Project at Penn State focuses on reducing childhood obesity through a curriculum implemented in preschools. The intervention is a government-funded effort, receiving support from the Food and Nutrition Services (FNS) within the USDA and Pennsylvania's TRACKS program and SNAP-Ed program.

The intervention consists of a 28-week long program that has both an introductory and polite-tasting lesson, as well as a lesson for each week about a food corresponding with each

letter of the alphabet. Teachers are trained how to present the lessons, which include an educational segment as well as a tasting of the food of the week. The curriculum encourages a positive approach to foster excitement among the children about trying new and healthy foods. The goals of the program include increasing food literacy in the children, as well as increasing the willingness to try new foods.

Study Goals and Hypotheses

The goal of this study was to examine the efficacy of the Healthy Bodies Project on achieving its goal of increasing the health of preschool age children by addressing the following hypotheses:

1. Children's baseline food literacy will increase by the end of the program.
2. A greater increase in food literacy will be seen in classrooms in which teachers report a greater use of curriculum materials.

Chapter 2

Methods

Study Design Overview

In order to determine the impact of the intervention on increasing food literacy in preschool age children, 12 classrooms in 11 schools were selected from among the schools enrolled in the Healthy Bodies Project A-Z curriculum. Prior to beginning the program, the children participated in a food literacy assessment by trained research assistants that consisted of 4 questions. The first three questions asked about the characteristics of a specific fruit or vegetable, and the last question tasked the children with sorting pictures of the foods into two piles, one for fruits and one for vegetables. For the first question, the researcher showed children a picture of the food and asked the child to name it. If the child got the answer correct, they moved on to the next food, and the child was given a score of 2 for that food. If the child got the answer wrong, the picture was set aside. Once the child had a chance to identify all 4 foods, the foods they did not correctly identify were placed in front of them. The researcher then named the food and asked the child to point to it. The researcher indicated whether the child got this answer correct or incorrect. Each correct answer at this stage got a score of 1. Next, the child was asked if the food grew on a tree/bush or in the ground. This is a concept taught in every lesson about a fruit or vegetable. Lastly, the child sorted the food into a fruit or vegetable group. After the children completed the A-Z curriculum, they received the same assessment. Statistical analyses were used to compare the two scores, as well as analyze the impact of factors including

teacher enthusiasm and age on the differences in pre and post-assessment scores. The first two questions were summed together, for a maximum score of 2 per food and 10 for the total assessment.

Subjects

The subjects were 105 preschool children between the ages of 3 and 5 in 12 classrooms from center-based childcare centers in Central Pennsylvania. Classrooms were made up of new participants, as well as children who had been previously exposed to the program. Unfortunately, the exact number of previous participants is unknown. Given the limited contact that schools have with parents/caregivers, we were not able to measure family demographic information such as income and education. However, many of the families from participating schools were required to meet income eligibility criteria to enroll given that some centers were Head Start or Pre-K counts school. Through our communication with center/agency directors, the majority of families would be considered low income ($\leq$185% of the federal poverty level).

Statistical Analyses

Data were entered into Microsoft Excel and analyzed using both Microsoft Excel and IBM SPSS 12.0. Paired t-tests were used to compare means between the pre and post assessments, both overall and in relation to specific foods. Correlations were run to determine the relationship between frequency of use of supplementary tools and score improvement, and score improvements and both likelihood of trying and liking the food. Age and sex were also investigated as a possible source of influence on test scores by running correlations.

Chapter 3

Results

Food Literacy Assessment Analysis

The pre and post assessments were compared using only data from children who completed both the pre and post assessment. The average score on the pre-test for the first two questions was 3.69/10, and the average score on the post-test was 4.9/10, with an average improvement of 1.21 points. These results are displayed in Figure 1, and they were significant ($p<0.05$). This suggests that increases were a result of learning in the intervention, rather than baseline characteristics of the child, such as intelligence or prior knowledge.

The food literacy assessments were also analyzed per fruit and vegetable. As depicted in Table 2, every fruit and vegetable showed a statistically significant improvement in score ($p<0.05$) from pre to post assessment. Figures 3 through 7 show the average score improvements per food. The scores were also analyzed by improvement based on pretest score. The lower scores of 1-4 showed the greatest improvement, as shown in Figure 2. The lack of improvement for children who received a zero on their pretest is likely due to personality factors. Shy children may simply not respond or pretend to not know an answer, giving them a score of zero on both their pre and post tests.

The Influence of Teacher Use of Classroom Tools

The average improvement per classroom was correlated with both number of overall tools used, as well as frequency of use of each tool. There was no statistically significant relationship between the number of tools used and score improvement. This implies that it is not the number of tools the teacher uses, but perhaps the effectiveness with which the teacher uses them and conveys the information in general. There was also no one tool that stood out as particularly impactful on the results. This adds to the theory that it is not the tools, but the enthusiasm with which the teacher uses them.

The pretest scores per classroom were also correlated with the percentage of children willing to try the foods and the percentage of children who reported liking the foods. The p-value was 0.07 for average pretest score and willingness to try the food. While not statistically significant, it does suggest that the more knowledge a child has of different foods upon entering the program, the more likely they will be to try the food. This supports the notion that children are predisposed to have a neophobic reaction to new foods, thus making them less willing to try a food that is unfamiliar. There was no statistically significant relationship between pretest score and likelihood of liking the food. Average improvement in scores per classroom were also correlated with percentage of children who tried the food and percentage of children who liked the food. There were no statistically significant results. However, the p-value for average improvement and children liking the food was 0.095, suggesting that the more a child enjoys a food, the more likely they are to remember it.

Finally, age and sex were investigated as possible factors influencing score. Females had an average improvement of 1.34 from pre to post assessment, while males had an average

improvement of 1.10. Furthermore, age was significantly positively? Negatively? correlated with post-assessment score ($p<0.05$), though there was no correlation with pre-assessment score.

Chapter 4

Discussion

Literacy Assessment Results

This study had the goal of analyzing the impact that the Healthy Bodies Project had on increasing the food literacy of preschool age children. The results clearly indicate a statistically significant increase in food literacy in the children from pre to post assessment. When looking at the results for each food, the least statistically significant increase is found in assessing knowledge of tomatoes. This is likely due to a tomato being a highly recognizable food even for preschool age children, and thus there was little room for improvement from pre to post assessment.

Based on the results of the average improvement based on pretest score, it is clear that the program is most effective for children who have low levels of food literacy. The children who showed the greatest improvement had the lowest initial scores, as shown in Figure 2. These results suggest that the pretest could serve as a screening tool for the program. Classrooms with average pretest scores in the lower range are excellent candidates for the intervention.

The influence of age on post-test scores, but not pre-test scores, suggests that the older children in the 3 to 5 age range may have the ability to retain more of the information from the program. There was no correlation between age and pretest score, suggesting that age did not contribute to a discrepancy in baseline knowledge between children entering the program. This indicates that the program will be equally effective for all age ranges in preschool classrooms.

While the pretest score and improvement values from pre to posttest showed no significant correlation with the children's willingness to try or likelihood of enjoying a food, the

results were promising for future studies. It is possible that with a larger sample size, the higher pretest scores will have a statistically significant impact on a child's likelihood to try the food due to having an increased range of familiar foods. This prediction is consistent with many studies that report familiarity breeds liking in young children (Birch, 1979). A child is more likely to try a food with which they are familiar. Furthermore, there seems to be potential for a statistically significant result in further studies regarding children liking a food and seeing a large improvement from pre to posttest. This demonstrates the bi-directionality of the correlation between familiarity and liking. The more a child likes a food, the more likely they are to remember it come the posttest.

Teacher Tools Results

The results concerning the teachers' usage of supplementary tools did not support my hypothesis. The lack of statistical impact of the tools could be due to the fact that it is the way in which the teacher uses the tools, rather than the tools themselves, that makes the difference in food literacy improvement across the 28-week program.

Study Strengths

This study was as uniform as it could be, considering the nature of the project. The teachers received identical training, as well as the same materials, the classrooms had the same age range, and the pre and post assessment was simple to conduct, but effective at assessing food literacy. The population was also relatively uniform, as many of these schools are part of the Head Start program, which provides early childhood education, health, nutrition, and parent

involvement services to low-income children and their families. Therefore, many of the children in the study came from a low-income, low literacy population. This is a community for which there is a great need for nutrition education and resources, and thus the intervention was able to have more of an impact. Furthermore, schools are an excellent venue from which to reach a large portion of the community. Schools often encourage parental involvement, and we were able to take advantage of events in which parents would be present to reach out and educate them as well. While this was not included in data analysis, anecdotal evidence has suggested that our presence and nutritional advice is impactful in the lives of these families. Ensuring parental involvement in developing the eating habits of their children is crucial, as has been cited in literature.

Research Limitations

It was unknown whether or not the subjects had participated in the study in previous years, which may have skewed the pre-assessment scores to reflect a higher score than it would have been had the children who had previously participated been removed from the analysis. There was also the potential for a much larger sample size. There were 410 children assessed at the end of the program, but only 105 were assessed at the beginning of the program. While 105 is still an impactful sample, there was much unusable data.

Furthermore, there were many factors that were difficult to control for in a study of this size and nature. The assessments were administered by Penn State students, and it is possible that the perceived approachability and friendliness of the people administering the assessment affected a child's willingness to respond. Shy children may have been less likely to even attempt

a question at all, regardless of whether or not they knew the correct answer. Teacher personalities and involvement with the project also varied widely in the program. The teachers all received the same training at the beginning of the intervention, but they differed in levels of enthusiasm and consistency of reporting their data to the project. Though there was no significant relationship between any of the specific tools we supplied and an increase in score, it is still likely non-measurable factors such as enthusiasm and consistency were impactful on the results.

Future Directions and Applications

Permitting sufficient funds, future studies should consider including a control group in this study that also receive food literacy assessments at the same time as the experimental group. It could then be determined how much improvement in scores was due to the program, and how much was simply due to natural learning about common fruits and vegetables over time. In order to determine what the most effective parts of the program are the most impactful to trying, liking, and learning about the foods, different classrooms could also be assigned only specific parts of the curriculum for comparison purposes. It would also be helpful to investigate the influence of parental involvement on food literacy and willingness to try new foods by keeping track of home visits, parental attendance at family events, and use of weekly materials sent home, such as recipes and newsletters. Use of these materials could be tracked through surveying parents periodically. Keeping track of changes in the home is critical to future research, as many food literacy interventions conducted in schools do not lead to significant changes in diet quality in the home (Begley & Brooks, 2014). Though many agree that these interventions cannot serve as

the only method of combatting obesity, the potential of a nutrition intervention to have a wide impact and serve as an excellent foundation for change is widely agreed upon in literature (Evans et. al., 2002; Gittelsohn & Kumar, 2007). However, this may still not be enough. Involving the community and family did not show reduced obesity and BMI in children in half of the combined school-community interventions reviewed (Wang et al, 2015).

As this program has been proven effective in increasing food literacy, the next step is to implement these interventions on a larger scale. This research is validating what many upper end childcare centers already practice: encouraging consumption of fruits and vegetables and limiting sugar. The next goal should be to reach underserved populations, such as the centers included in this intervention in rural Pennsylvania. This research should continue and evolve to find the best methods to increase consumption of fruits and vegetables in young children. This intervention was shown to be most effective in the older children with the lowest food literacy scores. Therefore, future food literacy interventions should target children with lower levels of food knowledge with age-appropriate materials to ensure they are receiving the most effective education. The age range of 3-5 differs greatly in terms of development and eating behaviors, and it may be helpful to further split a group with that range (Birch & Fisher, 1998; Kohl & Hobbs, 1998).

Conclusions

The Healthy Bodies Project was able to significantly increase the food literacy in the preschool population of Central Pennsylvania through a 28-week nutrition intervention. Though there were no statistically significant results concerning trying, liking, and use of supplementary

tools, the p-values of the liking and trying data suggests that it may have been a false negative. A larger sample size in future research may be able to rule out or confirm this possibility. The Healthy Bodies Project works beyond just the immediate classroom environment, and attempts to involve the entire community. This method of getting involved in several aspects of peoples' lives is supported by the bio ecological model, and has more of an impact on the habits and behaviors of people than a singular approach (Bronfenbrenner & Morris, 2006). The continuation of this research is critical, as the obesity epidemic is a prioritized public health issue with widespread implications.

Appendix A

Supporting Documents

Literacy Assessment

Healthy Bodies Project – FUN Curriculum
Children's Food Recognition
Post-Assessment FY2016

Child's ID#: _____ Age: _____

Teacher/Classroom ID#: _____

School ID#: _____ Date: _____

Food Pictures of:	Do you know what this is? (pointing to each picture, not in any order)	Can you point to the picture of the _____?	Does this food grow on a tree/bush or in the ground?	Fruit/Vegetable Sort: Do they correctly have each F/V in correct column?
Cauliflower	C(1) *or* I(0)	C(1) *or* I(0)	C(1) *or* I(0)	C(1) *or* I(0)
Kiwi	C(1) *or* I(0)	C(1) *or* I(0)	C(1) *or* I(0)	C(1) *or* I(0)
Nectarines	C(1) *or* I(0)	C(1) *or* I(0)	C(1) *or* I(0)	C(1) *or* I(0)
Olive	C(1) *or* I(0)	C(1) *or* I(0)	C(1) *or* I(0)	C(1) *or* I(0)
Tomato	C(1) *or* I(0)	C(1) *or* I(0)	C(1) *or* I(0)	C(1) *or* I(0)

Key:

C = Correct

I = Incorrect

Level of Food Literacy Scoring: 1 for all Correct and 0 for Incorrect.

Food Recognition Score: _____

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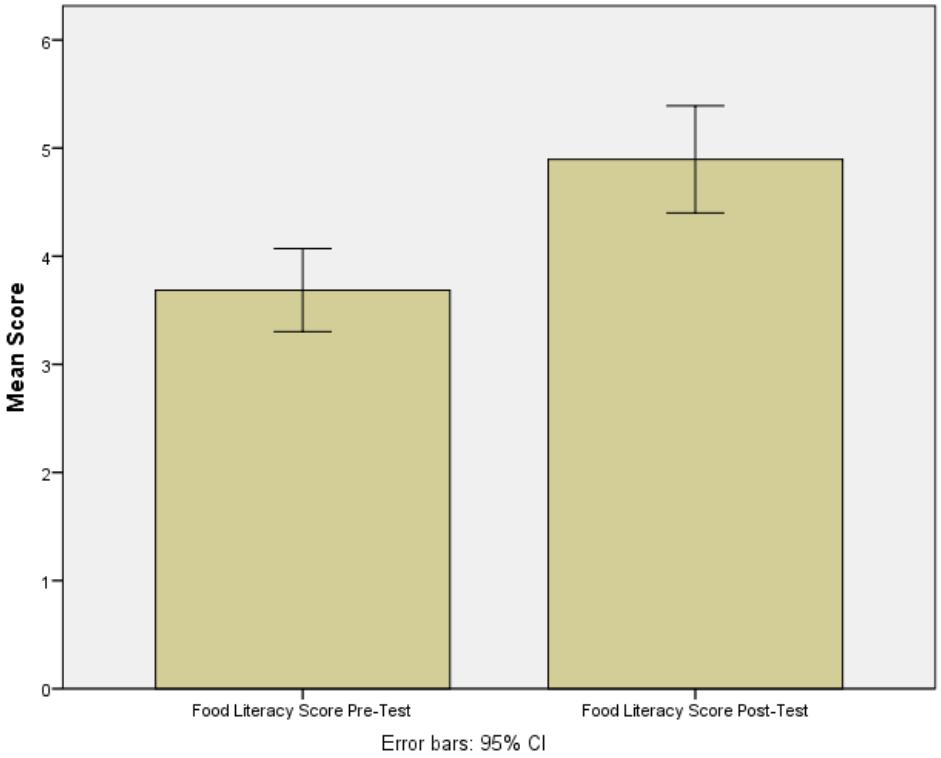

Figure 1: Average Food Literacy Scores

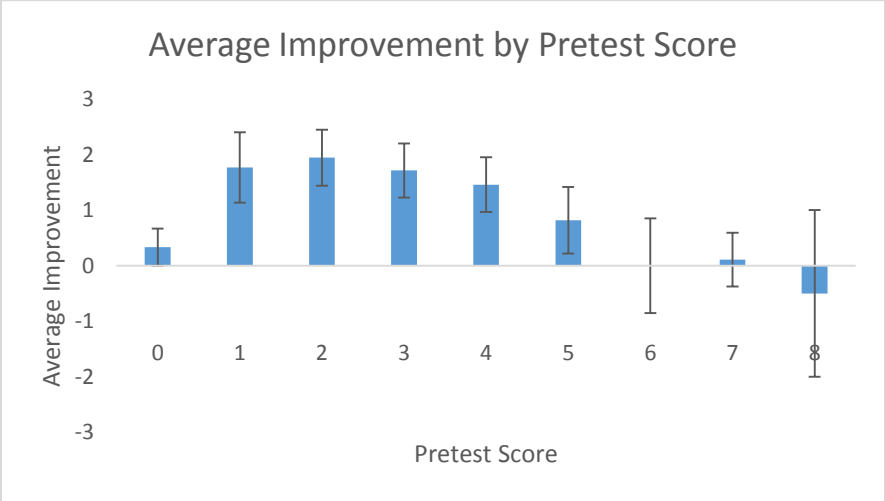

Figure 2: Average Improvement by Pretest Score

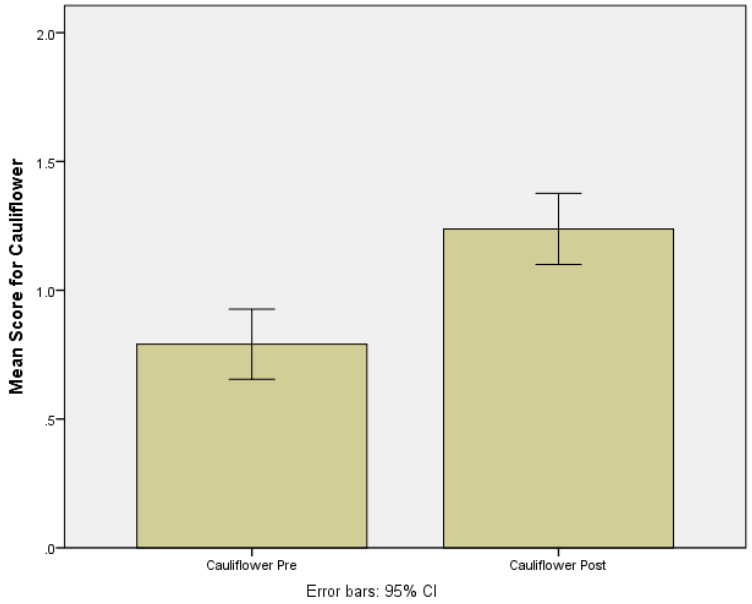

Figure 3: Average Pre and Post Assessment Score for Cauliflower

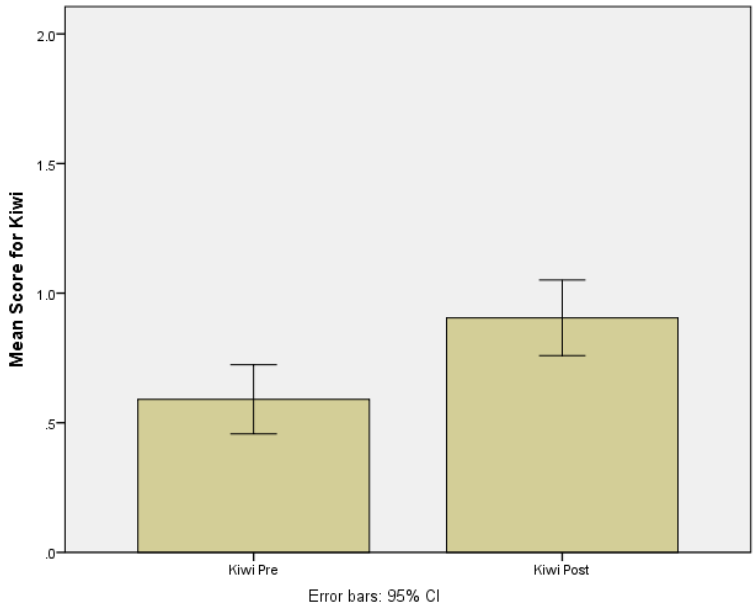

Figure 4: Average Pre and Post Assessment Score for Kiwi

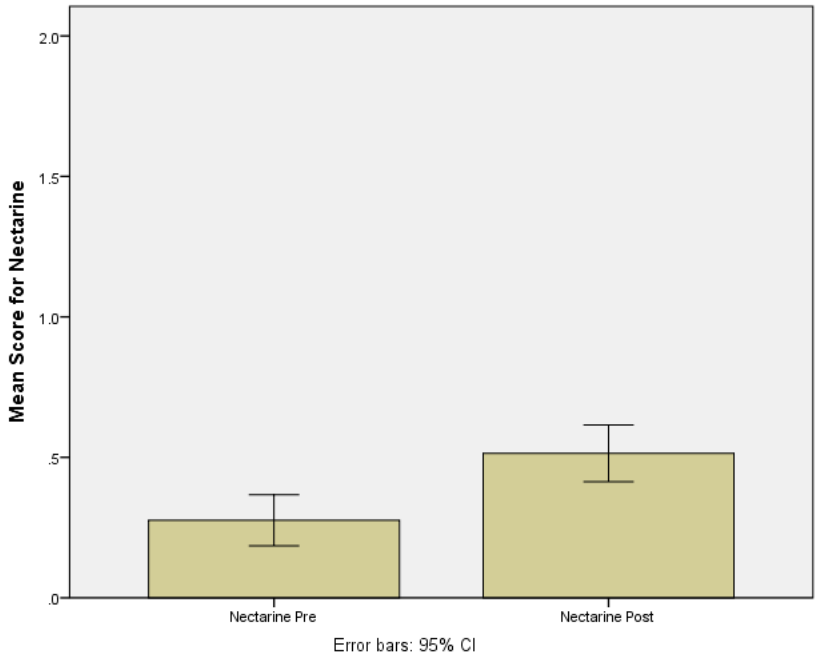

Figure 5: Average Pre and Post Assessment Score for Nectarine

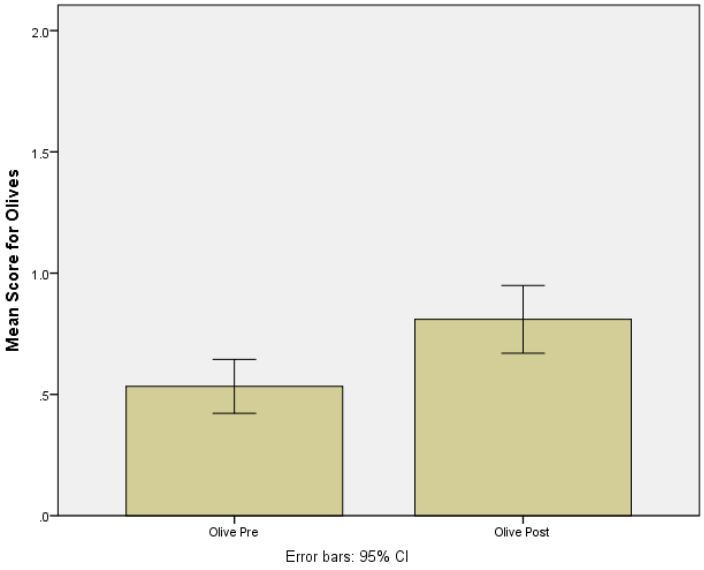

Figure 6: Average Pre and Post Assessment Score for Olive

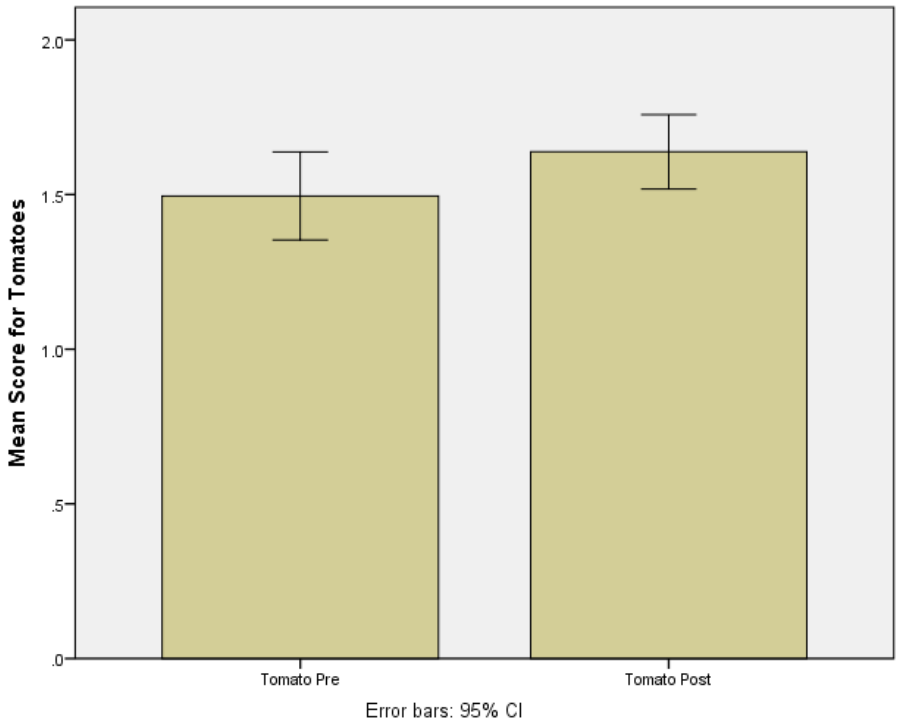

Figure 7: Average Pre and Post Assessment Score for Tomato

Table 1: Subject Description

Total Number of Participants	**105**
Number of Female Participants	47
Number of Male Participants	58
Total Number of Classrooms	12
Average Number of Children per Classroom	9
Age range of participants	3-5
Average Age for Pretest	3.8
Average Age for Posttest	4.6

Table 2: Pre and Post Assessment Outcomes

	Mean Pre Assessment Score	**Mean Post Assessment Score**	**Significance**	**N**
Overall (out of 10)	3.69	4.90	P<0.01	105
Cauliflower (out of 2)	0.79	1.24	P<0.01	105
Kiwi (out of 2)	0.59	0.90	p<0.01	105
Nectartine (out of 2)	0.28	0.51	P<0.01	105
Olive (out of 2)	0.53	0.81	P<0.01	105
Tomato (out of 2)	1.50	1.64	P<0.05	105

Academic Vita of Megan Helene Fiorillo

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Major: Bachelor's of Science in Biobehavioral Health

Honors: Dean's List Recipient Fall 2013, Spring 2014, Spring 2015, Fall 2015, Fall 2016, Spring 2017

Work Experience Elmcroft Senior Living and Memory Care, *State College location*

Resident Assistant Fall 2015- Spring 2016

- **Accumulated Hours: 300**
- Personal Care Unit: Responsible for aiding residents with activities of daily living
    - Additional tasks: minor wound care, administer topical treatments, and change catheters
- Memory Care Unit: Received special training to work with patients with late stages of dementia
    - Assistance with daily living; facilitate activities to keep patients mentally stimulated

Leadership and Research Experience The Pennsylvania State University: *University Park, PA*

Teacher for Summer Youth Nutrition Education Program Summer 2016

- Nutrition education program following the Power Panther Pals Curriculum and funded by TRACKS to teach preschool and school age children about nutrition and staying active

Student Team Leader for Healthy Bodies Project Fall 2014-Spring 2017

- Visit preschools in the area and assess the children's level of nutrition knowledge
- Develop and implement activities and presentations to educate preschool children about specific health topics
- Research topics related to childhood obesity and present this information to the rest of the lab
- Certified by Cooking Matters to lead grocery store tours, the purpose of which is to educate parents about eating healthy on a budget

Research Assistant on USDA Grant to evaluate new health programs for preschools Spring 2016

- elements to develop include segments on healthy eating, self-regulation, exercise, and CORE (elements taken from the Healthy Bodies Project)

Volunteer Experience The Pennsylvania State University: *University Park, PA*

Penn State IFC/Panhellenic Dance Marathon: THON 2013- 2015

- Member of the Dancer Relations Committee: Weekly meetings and responsibilities leading up to a 46 hour no sitting, no sleeping dance marathon, and training to assist dancers physically and psychologically during THON

St. Elizabeth's Youth Group Assistant (2013-2014)

- assist with weekly meetings, mission trip to pittsburgh for a week of community service

Crisis Text Line Counselor (Fall 2016- present)

- 40 hours of training to become a counselor
- 4 hours per week of volunteering