CALIFORNIA STATE UNIVERSITY SAN MARCOS

THESIS SIGNATURE PAGE

THESIS SUBMITTED IN PARTIAL FULLFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE

MASTER OF ARTS

IN

PSYCHOLOGY

THESIS TITLE: Preschool-Aged Children's Knowledge of Healthy and Unhealthy Foods

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DATE OF SUCCESSFUL DEFENSE: April 9, 2014

THE THESIS HAS BEEN ACCEPTED BY THE THESIS COMMITTEE IN
PARTIAL FULLFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS
IN PSYCHOLOGY.

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Preschool-Aged Children's Knowledge of Healthy and Unhealthy Foods

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Abstract

Research has examined food knowledge in elementary- and high school-aged children; however, very little research has been done examining preschool-aged children's understanding of health behaviors. The purpose of this research was to better understand preschool-aged children's ability to (a) make healthy food choices; (b) categorize healthy and non-healthy foods; and (c) determining whether media can affect food choices, specifically whether a children's book can influence food choices. For this study, I conducted interviews, asked children to sort food pictures, and conducted an experiment. Participants were 94 children ages 4 to 5 years from preschools in San Diego County and the surrounding areas. For the experiment, children were randomly assigned to hear one of two children's story books: one about vegetables and one about weather. A food sorting task was given both before and after the experimental manipulation. I predicted that exposure to a children's book about fruits and vegetables would affect the children's food choices and their understanding of healthy foods; specifically, that those who were read a book about healthy foods would choose a healthy snack over a less healthy snack (carrots over cookies) compared to children who were read a book that did not mention foods. A chi-square test of independence found that there was no significant difference in food choice between children who listened to a story about fruits and vegetables compared to children who listened to a story that did not mention foods. Additionally, I expected those in the experimental conditional to have an increase in their score on the sorting task (higher scores equal better understanding of healthy foods), and that girls from high socioeconomic status families would have the most correct responses on food sorting tasks of all the groups. A 2x2 mixed model ANOVA found that there was no difference for gender or socioeconomic status on the food sorting task scores. Therefore, the study hypotheses were not supported. However, due to the

lack of previous research in this area the findings from this study have the potential to fill gaps in the literature about young children's food preferences and health knowledge.

Preschool-Aged Children's Knowledge of Healthy and Unhealthy Foods

Childhood obesity has become an epidemic in the United States and costs 174 million dollars every year to diagnose, treat, and sustain individuals suffering from ailments that could have possibly been avoided by good nutrition, exercise, and proper health education (American Diabetes Association, 2011). Given that it may be easier to start good habits at a young age than to modify less healthy behaviors as an adult, it is important to start intervention programs at an early age to ensure proper health education and give people the tools to make healthy choices and take care of their body (Goldman, Whitney-Saltiel, Garnger, & Rodin, 1991, Kandiah & Jones, 2002; Kasparek, Corwin, Valois, Sargent, & Morris, 2008). The purpose of this study was to assess young children's knowledge of healthy foodchoices. In the following literature review, USDA recommendations for a healthy diet, negative effects of poor health habits, the theoretical model for this study, and influences on health behaviors are discussed.

Recommendations for a Healthy Lifestyle

Establishing healthy eating behaviors at a young age is important in order to avoid the risk of serious health related illnesses (Lanigan, 2010). Consequently, the United States Department of Agriculture (USDA) has set healthy eating guidelines for individuals of all ages (USDA, 2005, http://www.health.gov/dietaryguidelines/dga2000/document/ frontcover.htm). In the United States, these dietary guidelines have been taught in classrooms starting as early as elementary school (Contento, Randell, Basch, 2002). In addition to the food guidelines, the USDA has set recommended daily intake amounts of protein, dairy, grains, and fats. Additionally, the USDA suggests eating between 1,000 and 1,400 calories per day, depending on age, sex, and activity level for children aged 2 to 8. Of the total calories per day, 45-65% should be carbohydrates, 10-35% protein, and 20-35% fats. The USDA has also established

recommended weekly amounts of exercise and recommends that children ages 2 to 8 years old have a minimum of 60 minutes or more of physical activity each day.

In 1992, the USDA developed a model called the “food pyramid,” to visually display the proper amount of food consumption per day. It was created in order to provide a universal model of the recommended servings for each food group that should be consumed daily (Kennedy, 2008). The USDA daily recommendations for children ages 2 to 8 are six to 11 servings of grains (e.g., pasta, cereal, rice, and bread), two to five servings of vegetables, two to four servings of fruits, two to three servings of dairy (e.g., milk, cheese, and yogurt), two to three servings of protein (e.g., meat, poultry, eggs, nuts, and beans), with fats and oils to be eaten sparingly (USDA, http://www.nal.usda.gov/fnic/Fpyr/pmap.htm). The food pyramid is only a guideline that suggests what foods are necessary for daily consumption. These guidelines, as provided by the food pyramid, have been used in many studies to assess whether individuals are meeting the guidelines for the suggested daily intake of each of the food pyramid categories (e.g., Dickson-Spillman & Siegrist, 2010; & Kennedy, 2008).

However, the food pyramid has been criticized for not measuring the quality of an individual’s diet (Kennedy, 2008). Specifically, the food pyramid only tells people what foods they should be eating and the quantity, yet it does not explain what quality of food they should be eating in each category (i.e., whole grain breads and pasta vs. white bread and pasta). In the United States, these guidelines and standards are set to keep Americans living a healthy lifestyle. However, many people lack the correct knowledge and understanding to use these guidelines and integrate them into their daily lives. Although most research has shown that a significant majority of people understand nutrition and how to make good health choices, research provided by the American Diabetes Association (ADA) shows that simply knowing what choices are

better is not sufficient. Although people know what foods are right for them they do not make proper choices. For example, only 1 in 5 children eat the recommended five servings of fruits and vegetables per day (Bauer, Yang, & Austin, 2012). However, the food pyramid does provide the guidelines for understanding which particular foods are in a healthy diet (i.e., whole grains and non-fat or low-fat dairy products; Frobisher, Jepson, & Maxwell, 2005).

Individuals need to be educated on how to make healthy choices, and researchers need to discover ways to ensure that people follow through with the information provided (Birch, 1992; Frobisher et al., 2005). In particular, it is important for young children to be given the appropriate health education and to be equipped with the tools to create healthy habits when making food choices and other choices related to their physical well-being. It is possible that parents lack an understanding of proper nutrition and are teaching their children poor habits. Therefore, it is important to teach young children about proper health behaviors and give them the tools to make healthy choices for themselves as they grow up.

Negative Effects of Poor Health Habits

Increasing numbers of Americans are being diagnosed with heart disease, Type II diabetes, or are suffering from heart attacks or strokes (Fahlman, McCaurghtry, Martin, & Shen, 2008). Type II diabetes used to be referred to as adult onset diabetes because it was a diagnosis common among the adult population; however, during the last 20 years, an increasing number of children are being diagnosed as obese and having Type II diabetes. It is no longer appropriate to call the illness “adult onset” diabetes with so many children receiving this diagnosis every year (American Diabetes Association, 2011). The ADA released a fact sheet in 2011 reporting that 25.8 million children and adults in the United States (8.3% of the population) have diabetes, and 79 million people are diagnosed with pre-diabetes. The ADA also reported that about 1 in every

400 children and adolescents (i.e., people under 19 years old) have diabetes. This is a substantial increase from previous years, suggesting that food-related health problems are on the rise. Individuals with diabetes are at greater risk of developing a range of problems, including cardiovascular disorders, asthma, kidney disease, blindness, high blood pressure, and stroke (American Diabetes Association, 2011; Lanigan, 2010). To combat this negative health trend, it is important to understand what foods constitute healthy choices, how much to eat, and how much to exercise.

Theoretical Models for Health Behaviors in Young Children

There are many factors that can influence an individual's ability and desire to make healthy food choices including theoretical factors, as well as gender, socioeconomic status, and exposure to media.

Bandura's Social Cognitive Theory. Bandura found that people learn by observing, expecting outcomes, and having those expectations reinforced through incentives (Bandura, 1989; Crain, 2005; Rosenstock, Strecher, & Becker, 1988). Therefore, children learn when they observe a behavior, repeat the behavior, and receive positive reinforcement for the behavior. It is then that the child learns the behavior is appropriate (Rosenstock et al., 1988). Social cognitive theory suggests that there are goal directed behaviors from which individuals expect a positive outcome. Learning depends on the cognitive abilities of the individual: the more capable one is of understanding the environment, the more one will learn from one's surroundings (Bandura, 1979). Rosenstock et al. (1988) split Bandura's social cognitive theory into two parts: expectancy and incentive. Expectancy is defined as individuals' ability to do something (efficacy and motivation) and their belief about a positive outcome (Bandura, 1989; Rosenstock et al.,

1988). Incentive is defined as the consequence of the behavior (Rosenstock et al., 1988). Consequences may include positive or negative reinforcement.

During the preschool years, the primary sources for children's health knowledge are their parents, teachers, family members, media, and peers (Birch, 1980; Birch, 1992; Birch, Zimmerman, & Hind, 1980; Hart, Bishop, & Truby, 2002; Hays, Power, & Olvera, 2001; Lanigan, 2011; Stark, Collines, Osnes, & Stokes, 1986). For young children, eating is often a social event. They typically have people around them during meal times, which can provide many opportunities for modeling behaviors (Birch, 1993). Parents can support children's health needs by having them eat properly, having them engage in physical activity every day, and by limiting sedentary activities to no more than 60 minutes at a time (Lanigan, 2011). Parents are also responsible for presenting children with a variety of foods (Hart, Bishop, & Truby, 2002). Parents serve as the gatekeepers for their children, providing access and giving appropriate exposure to healthy and less healthy foods (Hays et al., 2002). Research has shown that the more foods a child has seen, the more variety of foods he or she will eat (Birch, 1992; Lanigan, 2011). Importantly, children will model behaviors they see from their parents, peers, and media, regardless of the value of these behaviors. Given that children model behaviors, parents should attempt to follow the rules they are providing for their children, instead of simply telling the children what to do and eat but not doing it themselves. The more involved parents are when providing food for their children and the more they can model healthy behaviors, the more knowledge the children will have about nutrition (Lanigan, 2011).

Bronfenbrenner's Ecological Systems Theory. The ecological systems theory encompasses all environmental and social influences with which a child will interact during his or her lifetime. Bronfenbrenner (1977) created this model to show all the systems in which an

individual belongs. These systems include the microsystems, mesosystems, exosystems, macrosystem, and chronosystem. The individual exists at the center of these systems and is affected by all of them. The microsystem is the immediate environment of the individual, including school, family, peers, church, and neighborhood play areas. For young children, the majority of their influence and experience will come from the microsystem. The mesosystems represent connections between microsystems, such as when parents go to back-to-school night or when peers come for dinner at a child's home. The outer systems include the exosystem, such as media, local policies, neighbors, parents' workplace, social services, and industry; and the macrosystem encompasses the individuals' broader culture. All of these systems exist within the chronosystem. This means all of these systems exist in a historical and changing time period. In order to better understand children's health, it is important to examine their surroundings and the effects those surroundings may have on their choices, behaviors, and attitudes about health and nutrition (Stokols, 1996).

Most young children have a very small social circle that is typically limited to their parents, caregivers, siblings, preschool teachers, and a small group of peers (Bauer, Yang, & Austin, 2012). However small these social circles play a pivotal role for the developing child. At home, children, especially young children, are influenced by their parents because they cannot prepare meals for themselves and rely solely on the foods that are provided by their parents. At school, children are influenced by their parents' choices of snacks to be packed and their teachers' and/or schools' choice of provided snacks. In addition, they are influenced by the snacks their peers' parents have provided for them, as it has been shown that peers' foods can influence the food choices children make (Birch, 1980; Kandiah, & Jones, 2002). Finally, media

also impact children's food choices by constant access to food promotions (Signorielli & Lears, 1992).

Factors that may Influence Health Behaviors in Young Children

Television Influence. On average, the television is on six hours per day in a typical American household and children over two are exposed to an average of three hours a day (Signorielli & Lears, 1992). A typical child spends more time watching television than doing any other activity (Lanigan, 2011; Signorielli & Lears, 1992). In one year, a child is exposed to over 22,000 commercials, 5,000 of which are related to food (Lanigan, 2011). Media can influence children's understanding of nutrition because of the messages that are aired during commercials and during television shows (Lanigan, 2011). Children's programming commercials are mainly geared toward unhealthy food messages, including promoting sugary cereals and breakfast treats (Signorielli & Lears, 1992). The amount of television watched is correlated with poor food choices (Lanigan, 2011). Parents often limit the type of television children watch, but not necessarily the network (Signorielli & Lears, 1992), and children are often allowed to watch channels that cater to them which may increase their exposure to food related commercials. There are publically funded channels that do not allow commercials, and any commercials that do air between scheduled programs are service announcements (e.g., PBS). These publically funded channels offer children's programs with no negative exposure to poor quality foods.

Other Media Influences. Magazines can also affect children's attitudes towards health due to the potential for children to be influenced by images of extremely thin female models and images of the ideal male figure (Drummond & Drummond, 2010). Other forms of media have the potential to influence children's health behaviors in a positive way. For example, Byrne and Nitzke (2002) read children a previously published story book about the vegetable kohlrabi.

They found that children who were read this story were twice as likely to try this novel vegetable as those in the control condition who were read a story that had nothing to do with food. This research shows that story books that depict children of similar ages may be able to influence children's choice in foods. Therefore, media can affect children's health in both positive and negative ways.

Interventions. Due to the large number of hours children spend in school every week, many researchers have posited that intervention programs and nutrition classes held during classroom time would aid in the prevention of childhood obesity and provide a stepping stone to good health in adulthood (Bauer, Yang, & Austin, 2012; Lanigan, 2011; Reynolds, Treu, Njike, Walker, Smith, Katz, & Katz, 2012; Stark et al., 1986). Children consume one-third of their daily caloric intake during school hours; this fact alone is a good reason to implement interventions during school hours (Reynolds et al., 2012). Researchers have shown that interventions and school-based nutrition programs do help to improve health practices in children (Contento, Randell, & Basch, 2002). Interventions have used story books that include ideas about trying novel foods (Byrne & Nitzke, 2002), videos about making good food choices (Reynolds et al., 2012), and classroom lectures through which good and bad food choices were taught (Stark et al., 1986). Interventions have been shown to give children a general understanding of good and bad foods and how to make good choices, but previous research has not investigated children's attitudes about healthy foods in depth.

Positive and negative reinforcement for food behaviors. Some studies have found that children who were provided positive reinforcement in the form of stickers and praise after choosing appropriate snacks continued to make good food choices (Birch et al., 1980; Stark et al., 1986). However, unless this reinforcement continues both at home and at school, the

behaviors are not likely to continue. These findings are important because 62% of parents give children sweet and salty foods as a reward or as a pacifier, or withhold such foods as a form of punishment (Birch, 1992; Birch et al., 1980; Wellman & Johnson, 1982). Foods that are given as rewards or withheld as punishment will often become more desirable than if the foods were limited. Children gain preference for sweet or salty foods with continued exposure to them. If exposure is limited, children may desire these foods less (Nguyen, 2008; Nguyen, 2007; Wellman & Johnson, 1982).

Gender. From an early age, girls are exposed to magazines, books, and television that influence their idea of how they should dress, look, and act (Hart et al., 2002). This media influence may be one reason that research shows females consistently understand the importance of health, dieting, and, exercise more than males (Drummond & Drummond, 2010). In gender comparison studies, males often refer to food preparation, diet, and exercise as feminine characteristics and attempt to avoid these areas to appear more masculine (Drummond & Drummond, 2010; Hart et al., 2002; Holub & Musher-Eizenman, 2012). Therefore, males are less likely to respond to health promotion media messages than females because they often see health promotions and dieting as feminine (Drummond & Drummond, 2010).

Socioeconomic status and education. Parents from low socioeconomic status homes have reported buying foods that they know their children will eat because they cannot afford to let food go to waste; therefore, they spend their limited resources on foods that may be unhealthy but that they can be sure their children will eat (Hart et al., 2002). Also, individuals living in low socioeconomic status homes are shown to have less education than those in high socioeconomic status homes (Patrick & Nicklas, 2005). Parents who are less educated about proper health, diet, and nutrition are less likely to have children who understand nutrition than parents who are more

educated about these issues (Nguyen, 2008; Wellman & Johnson, 1982). It is important that both children and parents are educated and given the tools to create good nutrition habits.

The Current Study

As discussed, several studies (e.g., Birch, 1980; Birch, 1992; Birch et al., 1980; Hart et al., 2002; Hays et al., 2001) have examined health knowledge in school-aged children; however, few researchers have assessed this important topic in preschool children. Children need to learn good health habits as early as possible. Currently very little is known about this young population and their health knowledge. Thus, the present study is designed to fill a gap in our understanding of young children's knowledge and attitudes about healthy and unhealthy foods. In addition, given that studies have found that girls are more likely to be cognizant of healthy foods than are boys, and SES makes a difference in availability and knowledge of healthy foods, these variables were explored.

For this study, I interviewed preschool-aged children about their food preferences and used sorting tasks to assess their understanding of healthy and unhealthy foods. In addition, I conducted an experiment to determine if children's understanding and attitudes can be changed through exposure to media, specifically a story book. Children were randomly assigned to hear a story that did not mention food (control condition) or a story about fruits and vegetables (experimental condition). After hearing the story, the children performed the sorting task again to determine if those in the experimental condition changed their ideas about healthy foods. A choice of snack was also presented to see if they would choose cookies or carrots. Parents of the children completed a brief survey asking questions about food, education, income, and occupation.

Using data from the sorting tasks, child interviews, and parent responses, I predicted that:

H_1: Girls from high SES families would have more correct responses on the food sorting tasks compared to those from low SES families or boys.

Based on the experiment, I predicted that:

H_2: Children in the experimental condition would have a higher score on the food sorting task than those in the control condition.

H_3: Children in the experimental condition would be more likely to choose a healthy snack rather than an unhealthy one compared to children in the control condition.

In addition, one research question was addressed:

RQ_1: What foods do preschool-age children like and dislike?

Method

Participants

The sample consisted of 94 children aged 44 to 67 months (*M* = 57.09, *SD* = 7.86) who attend child care centers, college lab schools, private preschools, as well as community members in San Diego County and the surrounding areas. Children of both genders participated and an equal number of boys and girls were assessed. Children were predominantly White (57.4%) or mixed race (22.3%). Half of the children in this study are from families who reported annual household incomes of more than $100,000.00. A full list of demographic percentages can be seen in Table 1. Children with major medical or developmental disabilities were excluded, this included children with diabetes. All participants spoke fluent English.

Power Analysis

Due to the dearth of literature about health knowledge in preschool aged children I chose the following studies because they most related to the proposed study. All of the following effect sizes were converted to *r*'s so they could be averaged together for a total effect size. Birch (1980)

examined children's preferred food choices when given healthy and non-healthy snack options and her findings yielded an effect size of 0.22 (small). Lanigan (2010) examined food selection of healthy snacks and found an effect size of 0.41 (medium). Wardle, Herrera, Cooke, and Gibson (2003) examined children's food choice after a positive reinforcement intervention and found an effect size of 0.59 (medium). Looking at the amount of exposure to novel foods and the effect on children's preference after the exposure, Sullivan and Birch (1990) found an effect size of .17 (small). Holub and Musher-Eizenman (2012) examined children's food preference through picture sorting tasks (0.43, medium), dessert preferences (0.49, medium), and gender differences in health knowledge through picture sorting tasks (0.27, small). Goldman, Whitney-Saltiel, Granger, and Rodin (1991) assessed general nutrition knowledge in young children and found an effect size of .88 (large). Children's knowledge was compared to parents' level of education and socioeconomic status by Signorielli and Lears (1992) who found an effect size of .51 (medium). An average of all the effect sizes was taken and yielded an effect size of .45 (medium). Calculations at .80 power, .05 alpha, and a medium effect size yielded a minimum sample size of 45 participants per condition. Given that there were two experimental conditions, a minimum of 90 preschool aged children was needed for the current study.

Measures and Procedure

Parent Consent and Survey. Preschools around San Diego County were asked to participate in this study assessing health knowledge and attitudes of preschool children. If the preschools agreed to participate, the researcher sent home consent forms and a short survey with all of the children aged 4 to 5, asking parents for consent for them and their child to participate. In addition to the consent form, parents were asked to fill out a short demographics page asking information about their annual household income, highest level of education for both mother and

father, and 10 questions about their child's eating habits (e.g., the foods their child prefers to eat and what the child refuses to eat). Socioeconomic status (SES) was calculated based on parents' reported education level, occupation, annual income, and marital status. Each category was given a score based on the *Four Factor Index of Social Status* (Hollingshead, 1975). These three scores were then be added up and divided by two (if married). The scores ranged from 25 to 66 (M = 45.2, SD = 11.39; 72 valid cases, 22 missing). Based on the final score, Hollingshead designates high, medium, and low SES categories. The complete parent survey can be seen in Appendix A. The parents then returned the signed consent form and completed survey back to the child's school if they wished to participate.

Introduction and Assent. A specially trained interviewer was introduced to the children by the childcare provider or teacher. The children were told that just a few of them would be asked if they want to play with the interviewer and they could say no if they did not want to play. The interviewer then selected each child one by one who had written parental consent. The children were again reminded if they did not want to play they did not have to, they could go back to their classroom at any time, and they could use the restroom or take a break at any time. After a brief explanation of the activities, the child was asked to give his or her verbal assent to participate.

Child Interview. The interview took between 15 and 30 minutes. The interview involved ten questions taken from previous studies about health understanding in elementary and middle school-aged children (Bauer et al., 2012; Drummond & Drummond, 2010; & Frobisher, et al., 2005). The questions that were chosen are appropriate for this population because they are short questions that are easily understandable. The questions were asked in two sets of five questions at a time, broken up by sorting activities. The first five interview questions were: Do you have a

TV in your room? Do you own any video game units? If so, what video game units do you own? Where do you eat dinner? Do you eat dinner together with your family? Do your parents have rules about eating your food? The complete child interview can be seen in Appendix B. While the child answered the questions, the interviewer took notes as well as audio recorded each session. The audio recordings were later used to assess inter-rater reliability of the coding.

Sorting Tasks. Previous research has shown the difficulties involved with directly asking children what foods are good for them and what foods they prefer. It is difficult to elicit responses from young children as they may not have the cognitive ability to form proper answers; however, picture sorting tasks have been successful in assessing these attitudes in children (Hart et al., 2001; Holub & Musher-Eizenman, 2012; Lanigan, 2011). Following previous research, the children in this study used picture sorting tasks to show the researcher what foods they believe are healthy, unhealthy, and neutral as well as to show what they like and dislike. The interviewer showed the child three pictures of cartoon faces on cards, varying in expression (happy, sad, and content). Each card was 4” x 6.” The child was asked by the interviewer, “Can you point to the picture of the face you would make after you ate something that tastes good (something you really liked)?” Next the child was asked, “Can you point to the picture of the face you would make after you ate something that tasted really bad (something you did not like)?” Finally the child was asked, “Can you point to the picture of the face you would make if something tasted just okay, not good and not bad?” Then the child was handed a stack of 22 pictures and asked to place them into piles next to the faces they would make if they ate those foods. After each sorting task the pictures were removed from the table and a new stack of pictures depicting the same faces and foods was placed in front of the child. He or she was asked to sort the pictures again, but this time into piles of what foods are good for them, bad for them,

and just okay for them. Based on USDA guidelines, there were 11 healthy food options, 7 unhealthy food options, and 4 neutral food options. The child's score was based on the number of food items placed into the correct categories in order to create a continuous dependent variable that ranged from 0 to 22. In this study, the scores on all four tasks ranged from 4 to 20 (M = 12.39, SD = 3.27).

The interviewer then asked the child the second set of 5 interview questions (Do you like the taste of food that is good for you? Do you think there are foods that are good for you at home? Do your friends like foods that are good for them? Do your friends eat food that is good for them? What do you think happens if you eat foods that are bad for you?).

Interview Coding. Blind coders transcribed 30 of the interview responses to the ten questions. If their transcriptions matched (each coder transcribed the same response for the child), they were given a score of 1 and if they didn't match, they were given a score of 0. Inter-rater reliability was assessed comparing the matches to mismatches. This resulted in 86% reliability. In cases where there was a mismatch, the principal investigator reviewed the transcriptions, and generally found that the mismatch occurred if the transcribers wrote a different word for the same answer (e.g., the transcriber either wrote that the child said nothing, or nodded).

Experimental Manipulation. The researcher randomly assigned each child to the control condition or the experimental condition by referring to a printed list of numbers from a random number generator (random.org) and assigning children to condition by going in order of the numbers printed. Children who were assigned an odd number were in the experimental condition, whereas those assigned an even number were in the control condition. Children in the experimental condition heard a short story about a big brother teaching his little sister to love

vegetables (*I Will Not Ever Never Eat a Tomato*; Child, 2012). Children in the control condition heard a story about weather that had no mention of food (*Down Comes the Rain*; Branley, 1983). The books were similar in length and style.

After the sorting tasks, the interviewer told the child they will now be reading a story together. The interviewer read the book aloud in order to allow for natural interruptions. Following Bryne and Nitzke (2002), each child was offered a choice of a healthy (carrots) or unhealthy (cookies) snack after reading the books to see if the use of a children's story book affected food choices. After the book was read to the child and snack choice was made, he or she was then asked to sort the same 22 pictures of food again into piles of good for me, bad for me, and just okay for me.

Manipulation Check. In order to check that each child actually listened to the story book, the researcher asked each child at the end of the session if they remembered the book and what the book was about. This procedure served as a manipulation check for the experiment. Finally, the child was given a small book to thank him or her for participating; each child was thanked for his or her cooperation, and walked back to the appropriate classroom.

Results

Preliminary Analyses

Data Coding. Responses from the interview questions were transcribed from recordings. The researcher examined the transcribed notes for themes in the interview responses. The themes that were found from the interview data were qualitative in nature, but were coded so the data could be entered into SPSS as quantitative data. Preliminary analyses (Q-Q plots and histograms) were conducted to check the dependent variable (food score on sorting tasks) for

homoscedasticity and normality of the distribution. The dependent variable was normally distributed. The data met the assumptions of the tests used for the hypotheses.

Tests of Hypotheses

Hypothesis 1, that there would be an interaction of gender and socioeconomic status on the food sorting score, was analyzed with a 2-way Analysis of Variance (ANOVA). The dependent variable was children's scores on the food sorting task and the subject variables were gender and socioeconomic status. Of the 94 participants, 20 had missing data needed for the socioeconomic status calculations and were dropped from this analysis; therefore, 74 children (33 males and 39 females) were included in this analysis. Socioeconomic status (N = 72, M = 45.21, SD = 11.39) was divided into 3 categories; high (n = 20), medium (n = 48), and low (n = 4). According the Hollingshead, parents who received a score between 0 and 29 were considered low socioeconomic status, between 30 and 54 were medium, and between 55 and 66 were high socioeconomic status.

The results revealed no significant effect of gender on the food sorting task. Males (n = 33, M = 11.70, SD = 3.14) and females (n = 39, M = 12.62, SD = 3.06) did not significantly differ in their food sorting scores either before the experimental manipulation $F(1,66) = 1.01$, $p = .32$ or after $F(1, 66) = .05$, $p = .82$. The results revealed no significant effect of socioeconomic status on sorting tasks. Socioeconomic status did not affect the sorting scores before the experimental manipulation $F(2, 66) = 1.90$, $p = .16$ or after $F(2, 66) = .46$, $p = .63$. Contrary to the hypothesis, no significant interaction was found between socioeconomic status and gender on children's understanding of healthy foods.

Due to the small number of participants included in this analysis, a median split was used to collapse the socioeconomic scores into low and high categories. Those included in the low

category had scores from 0 to 42 (n = 45; 22 males and 23 females) and the high category included scores from 43 to 66 (n = 27; 11 males and 16 females). A 2-way ANOVA was run using this new socioeconomic status variable (low and high) and gender as the fixed factors and total score on food sorting tasks as the dependent factor. The results revealed no significant effect of gender on the food sorting task. Males and females did not significantly differ in their food sorting scores either before (N = 94, M = 11.94, SD = 3.21) the experimental manipulation $F(1,68) = .95$, $p = .33$ or after (N = 94, M = 11.89, SD = 2.91) $F(1, 68) = .04$, $p = .84$. The results revealed no significant effect of socioeconomic status on sorting tasks. Socioeconomic status did not affect the sorting scores before the experimental manipulation $F(1, 68) = 3.34$, $p = .07$ or after $F(1, 68) = .19$, $p = .66$. Contrary to the hypothesis, no significant interaction was found between socioeconomic status and gender on children's understanding of healthy foods before $F(1, 68) = .16$, $p = .69$ or after $F(1, 68) = .2.19$, $p = .14$.

Hypothesis 2, that the experimental condition will increase the sorting score, was tested with a 2x2 mixed model ANOVA with the before and after sorting scores as a repeated measures variable and the experimental and control conditions as the between subjects variable. I expected that there would be an interaction such that the before scores would be similar for the two groups and the after scores would be significantly different. The results revealed no significant differences between the two conditions $F(1, 92) = .88$, $p = .35$, and no significant interaction between the conditions and the experimental manipulation $F(1, 92) = .25$, $p = .62$.

Hypothesis 3, that the experimental condition will have an effect of food choice, was analyzed with a chi-square test of independence, using experiment versus control and carrots versus cookies. The chi-square test was not significant, X^2 (1, N = 90) = .62, $p = .43$. There were 90 total children that made a food choice between carrots and cookies (Carrots N = 25, Cookies

N = 65). In the control condition 31% chose carrots and 69% chose cookies. In the experimental condition 24% chose carrots and 76% chose cookies. These percentages show that the manipulation was not effective.

The research question, regarding whether children know what foods are healthy versus not healthy, was analyzed using frequencies and percentages. Scores were given to each child based on his or her sorting of food pictures into three categories (healthy, unhealthy, and neutral). The pretest sorting scores showed that most children correctly categorized healthy foods before the experiment. Out of 11 possible correct choices, 70.3% got a 9, 10, or 11; 29.7% correctly categorized 8 or below of the healthy food choice pictures. Out of a possible 7 correct choices, 17% of children correctly categorized 5, 6, or 7 of the unhealthy foods; 83% correctly categorized 4 or less of the unhealthy food pictures. Out of a possible 4 points only 2.1% of children correctly categorized all four of the neutral foods, 62.8% scored a 0. For all the percentages, see Table 2 through 4. A chi-square test showed that the experimental manipulation had no effect X^2 (1, N = 90) = .62, p = .43. Children did not have significantly higher food sorting scores in any of the three categories post manipulation.

Discussion

The purpose of this study was to investigate (a) what preschool-age children understand about healthy food, (b) the effect of media on children's food choices as well as (c) the effects of gender, and (d) socioeconomic status on food knowledge. The hypotheses constructed to test these effects were not supported.

To my knowledge, only one study has used a children's book to influence food choices. The researchers in that study were able to show that children in the experimental condition chose to eat the food discussed in the book more often than those in the control condition (Byrne &

Nitzke, 2002). The current study aimed to replicate these results by using a children's book that discussed trying new foods (*I Will Not Ever Never Eat a Tomato*; Child, 2012). The foods in the book were fruits and vegetables. After the book was read the children were offered a snack choice of carrots or cookies. I expected the children in the experimental condition would choose the carrots more often than those in the control condition. The results showed no significant difference between the groups. The children overall chose the cookies more often than the carrots regardless of the condition. This finding was likely due to the cookies being far more tempting than the carrots. Children at this age may be too young to understand that cookies are not healthy, even though they like them. Research shows that college aged adults know what food choices are good for them yet they continue to make poor health choices; the authors speculate that this may be due to young adults feeling invincible at this young age (Lanigan, 2011; Signorielli & Lears, 1992) . For instance, children and adults both may feel that the food choices they make at this point in life will not affect their health later in life.

The children interviewed in the current study were younger than those in previous studies; because of this difference, I added another test of the manipulation. The children were asked in the beginning of the interview to sort pictures of 22 popular food items into categories of like, dislike, and neutral as well as healthy, unhealthy, and neutral. Previous research has shown that children understand what food items are good or bad for them (Birch, 1992; Birch, 1980; Stark et al., 1986). Following previous research, I asked the children to sort the pictures before the manipulation (baseline) and following the manipulation in order to compare the scores. I anticipated that the experimental condition would have higher sorting scores after the manipulation. However, unlike previous research (Stark et al., 1986), the scores stayed relatively similar across both time and condition. Children placed pictures of the foods into similar

categories before and after the manipulation. Also, the foods they sorted into piles of healthy, unhealthy, and neutral were similar to those they sorted into piles of like, dislike, and neutral. This finding suggests that children this age may not understand the distinction between foods they like and dislike and foods they think are healthy and unhealthy. It is possible children at this age believe the foods they like are foods that are "good for them." However, many of the children put the picture of cookies into the unhealthy pile and still chose the cookies as the snack. It is possible that children, like adults, do not always eat what is good for them, but rather eat what they prefer (Sun, 2008).

Gender has been shown to affect nutrition understanding in previous research, specifically, that females are more likely to respond to health messages and comply with health promotions than males (Drummond & Drummond, 2010). The current study examined possible gender differences between an equal number of male and female participants, but found no gender difference in food choices or the food sorting tasks. Males and females in the current study did not significantly differ in their choice of cookies or carrots, or their food sorting scores pre- or post-manipulation. It is possible that gender differences, with regards to nutrition understanding, do not exist at this young age. Previous research showing that males and females differ in nutrition understanding were done in older children.

I hypothesized that socioeconomic status would play a key role in nutrition understanding. Previous research found that children from lower socioeconomic status families may make poor food choices and lack nutrition knowledge because the parents buy foods that they know their children will eat, but that is not necessarily healthy, so nothing goes to waste (Hart et al., 2002). Parents from low SES families may perceive healthy foods as expensive and difficult to prepare (O'Dea & Wilson, 2006). For example, those parents may also feel that if

their children do not eat the healthy foods and they go to waste then they have spent money on food they could not afford only for it to go to waste (O'Dea & Wilson, 2006). Furthermore, previous research shows that income and education level of the parents are linked to nutritional knowledge (Drummond & Drummond, 2010; Hart et al., 2002). The current study did not show differences among children of differing socioeconomic statuses. Children from low, medium, and high SES made similar food choices and did not have significantly different food sorting scores. The foods pictured in the sorting games were common, every day foods that most children have access to. Even with special diet restrictions, the pictures were of foods that were accessible to most children. Because of this, it is possible that the children had a common amount of knowledge for the foods and did not show any significant difference in how they sorted them.

Lastly, the current study was unable to replicate results of the interaction between gender and socioeconomic status found by Hart et al. (2002). Both males and females of high and low socioeconomic status scored similarly on the food scores and made similar food choices. As described above, it is possible that children aged 3 to 5 years old are still too young to understand the distinction between healthy foods and foods they like.

In order to address the research questions using the children's sorting scores, I gave each child a score for each category (healthy, unhealthy, and neutral). These scores showed that a majority of children (70.3%) knew what foods were healthy for them before the manipulation, and 17% of children understood what foods were unhealthy for them. Interestingly, although children seem to know what foods are good and what foods are bad, out of the 90 children who made a food choice, 72% of them chose cookies over carrots. These results are similar to

previous research that shows adults know what foods are healthy and unhealthy and still make poor health choices (Bauer et al., 2012; Frobisher et al., 2005; Goldman et al., 1991).

Strengths and Limitations

This study had both strengths and limitations. The first strength was that the researcher or researcher's assistant conducted private interviews with all the children. This allowed each child the time necessary to complete the sorting tasks and allowed for natural interruptions and questions from the child. Also, the one-on-one setting allowed each child to have the attention he or she needed to respond to each interview question and task. Previous researchers have conducted interviews in group settings which gave shy children the opportunity to limit their participation (Hart et al., 2002). Previous research suggested conducting private interviews to allow each child to voice his or her thoughts, preferences, and opinions (Drummond & Drummond, 2010; Hart et al. 2002). This setting also allowed each child to answer every question without influence or interference by his or her peers. The second strength was that the children were interviewed in a familiar setting, either their school or their homes. The interviewer asked permission from each child before the interview began and the child could see the classroom or parent at all times. This procedure allowed children to be more comfortable with the interviewer and respond to questions with less stress than if they were in an unfamiliar setting.

The limitations of this study include a relatively long interview process for children this age, as well as possible time of day effects. Additionally, the sorting activities may have been too tedious. The first limitation of this study is there were only 4 children whose parents reported being of low socioeconomic status, compared to 20 high and 48 medium. Because of the low numbers of high and low it is difficult to generalize these findings to other low or high

socioeconomic status children. It may also be possible that the limited number of children from low SES families limited the power to detect differences between the groups. Second, the children were asked to sort 22 pictures of foods four separate times. It is possible by the fourth time, when they were asked to sort into piles of healthy, unhealthy, and neutral, they were already tired of sorting the pictures and did not put thought or effort into the task. It is possible as the length of the interview increased the children's self-control decreased and the likelihood that they would chose cookies increased. Lastly, children were typically interviewed in the early morning to mid-afternoon. Due to the differences in time of interview between participants, some children may have been hungry (before lunch) or full (after lunch); this difference may have impacted children's responses to the sorting activities and food choice.

Other possible reasons the hypotheses were not supported were the choice of books and the choice of foods. It is possible the book chosen for this study was not persuasive enough to get children to choose a healthy snack. The book (*I Will Not Ever Never Eat a Tomato*; Child, 2012) depicted an older brother showing his younger sister that trying new foods she previously dismissed would taste better than she would have expected. It is possible this story was not direct enough for children this age. Previous research used a children's book that was specifically designed to persuade children to try a specific new vegetable (Wardle et al., 2003). Also, the food choices used for the current study were carrots and cookies. It is possible that children aged 4 to 5 are more tempted by cookies than carrots regardless of any media influence. Lastly, the parents in this study were not asked questions about their own health. Children's healthy eating could also be a product of shared genes with parents to the extent that genes impact health behaviors (Baier & Deatrick, 2011). For example, previous research has shown that children of parents with diabetes have a different influence on their children's food choices and health

knowledge than parents without diabetes (Goldman, 1991; Lipman, Schhucker, Ratcliff, Holmberg, Baier, and Deatrick, 2011). Parents with diabetes have to understand more about health than parents without diabetes because they have to understand how to control and manage their blood sugar. Some of this information may get passed down to their children from directly telling or indirectly observing. However, children with any health issues, including diabetes, were not included in this study.

Future Research

The current study aimed to answer questions about young children's food knowledge and choices. Previous research has focused on elementary-aged children and beyond; very little research has been done in the preschool-age population. The current study did not find support for the hypotheses; this lack of support may be due to the limitations that could easily be remedied. Future researchers should include equal numbers of children from high, medium, and low socioeconomic status families. It would be beneficial to interview children from low income cities and schools with a high report of free or reduced lunch plans in order to get a more balanced sample of high SES children and low SES children. Children who qualify for the free or reduced meal plan come from poverty level families. Also, future researchers should use a children's book that is more persuasive about eating healthy foods and not simply suggest trying new foods. Another suggestion would be to use a short video of similar-aged children choosing healthy snacks. This would suggest to the children that their peers like healthy snacks and perhaps they will too. Furthermore, due to the young age of the children in this study, future researchers should find a snack that is less tempting than cookies. Children at such a young age may choose cookies simply because they are more desirable than carrots whether or not any type of media persuades them to believe that particular foods are healthier than others. It may also

benefit future researchers to examine peer influence on preschool-aged children given that peers may influence each other to make better food choices more than a story book.

Conclusion

In conclusion, one important finding was that even at this young age, most children understand what foods are healthy for them, even if they don't choose to eat them—this finding is similar to findings with adults. However, the results of the current study did not support previous research findings that media can influence children's food choices. The current study aimed to educate children and influence their food choices. This study was novel in the field of nutrition understanding because little up to this point was known about preschool-aged children's preferences and knowledge. The study was mainly exploratory and aimed to learn more about this previously uncharted territory. It is possible that children aged 4to 5 years old are still too young to have their food choices influenced by story books. Also, this study showed that children chose to sort the foods similarly in all sorting activities. This shows that children this age may not understand the distinction between "healthy" and "things I like."

The results did not support previous research findings that socioeconomic status can influence children's food knowledge (Hart et al., 2002). Previous research was able to show that children from families reporting high socioeconomic status have a greater understanding of what foods are healthy and unhealthy than those in families reporting low socioeconomic status (Hart et al., 2002). The current study lacked diversity of social classes; many of the participants were in middle or high socioeconomic status and may have had a similar understanding of what foods were healthy and unhealthy. Thus, if the limitations of this study were corrected and advice was followed for future researchers, the results of future studies may be different.

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Table 1

Table 1

Demographics of the Sample

		Percent%
Gender		
	Females	50.0%
	Males	50.0%
Ethnicity		
	Caucasian	57.4%
	Mixed	22.3%
	Asian	6.4%
	African American	6.4%
	Hispanic/Latino	7.4%
Income		
$100,000.00+		50.0%
$75,00.00 to $99,000.00		19.1%
$50,000.00 to $74,000.00		16.0%
$25,000.00 to $49,000.00		5.3%
$25,000.00 or below		6.4%

Table 2

Table 2

Food sorting scores for Healthy Foods

Score	Frequency	Percentage
2	1	1.1%
3	1	1.1%
4	3	3.2%
5	5	5.3%
6	5	5.3%
7	4	4.3%
8	9	9.6%
9	16	17%
10	20	21.3%
11	30	31.9%
Total	94	100%

Table 3

Table 3

Food Sorting Scores for Unhealthy Foods

Score	Frequency	Percentage
0	19	22.2%
1	15	16%
2	12	12.8%
3	6	6.4%
4	13	13.8%
5	13	13.8%
6	11	11.7%
7	5	5.3%
Total	94	100%

Table 4

Table 4

Food Sorting Scores for Unhealthy Foods

Score	Frequency	Percentage
0	59	62.8%
1	14	14.9%
2	11	11.7%
3	8	8.5%
4	2	2.1%
Total	94	100%

Appendix A

Parents, please fill out the following information about your child and family. ID#_____
(LEAVE BLANK FOR RESEARCHER)

About your child:

1. Child's first name _____
2. Gender of child (Circle one) M F
3. Date of birth of child _____ (MM/DD/YYYY)
4. Ethnicity of child
   _____ African-American/Black _____ Asian/Asian-American/Pacific Islander
   _____ Hispanic/Latino(a) _____ Middle Eastern
   _____ White/Caucasian/Euro-American
   _____ Other: if other, please indicate
   _____
5. Does this child have a TV in his or her room? (Circle one) NO YES
6. What video games does this child play? (Check all that apply)
   _____ Xbox _____ PlayStation _____ Wii
   _____ Nintendo _____ Nintendo DS _____ Other
   _____ child does not play video games
7. Is this child enrolled in any sports activities, such as soccer, T-ball, swimming, or others? YES NO
   If yes, in what sports does your child participate?
   _____
8. Is this child allergic to any food? (Circle one) NO YES
9. If so what are they:_____
10. Do you restrict any foods for this child? (Circle one) NO YES
    If yes, what foods do you restrict?
    _____
11. With whom does this child live? _____ Mother only _____ Father only _____ Both

About you and your family:

12. What is the yearly income in your household?
    _____ Less than $25,000 _____ $25,000 to 49,999 _____ $50,000 to 74,999
    _____ $75,000 to 99,999 _____ $100,000 or more
13. Father Occupation_____ Mother Occupation_____
14. What is Mother's highest level of education?
    _____ Some high school _____ High school diploma or GED _____ Some college

_____ College degree _____ Professional/graduate school degree

15. What is Father's highest level of education?

_____ Some high school _____ High school diploma or GED _____ Some college

_____ College degree _____ Professional/graduate school degree

16. During a typical week, how often do you eat dinner at a table together as a family?

_____ 0 nights _____ 1-2 nights _____ 3-4 nights _____ 5-7 nights

17. How many children are in your family? _____

18. Do you have rules about food? (For example, "You have to finish all your food before you leave the table" "You can't have dessert until you eat all of your food") (Circle one) NO YES

If yes, what are your rules? (You may use the back of this sheet if necessary)

_____

Thank you for taking the time to answer these questions. Please seal this sheet and the Consent Form in the envelope provided. Once we receive this, we will separate the consent form and this sheet so that your answers will never be tied to your name or your child's name.

Appendix B

Procedures

1. Ask preschools for permission to do research at their school

2. Send consent form and survey to parents of children attending preschools who have given their permission

3. Parents will be asked to send the consent forms and surveys back to the schools if they agree to participate

4. The researcher will randomly assign children who have parent consent and have given the researcher verbal assent to participate to either the experimental or control condition by assigning each child a number using a random numbers list from random.org. Odd numbers will be assigned to the experimental condition; even numbers will be assigned to the control condition.

5. Children will be interviewed by the researcher at their school during class time

Interview Process

1. Care taker/teacher will introduce the researcher to the children, children will be told only a few of them will be asked to play with the researcher and they do not have to if they do not want to

2. Children will be interviewed one at a time for approximately 20 to 30 minutes

3. The interviewer will give each child a brief explanation of the activities involved and ask the child to give his or her assent to participate

4. The interviewer will ask 5 interview questions

5. The child will sort 24 food pictures into piles of like, dislike, and neutral

6. The child will sort the same 24 pictures again into piles of good for me, bad for me, and just okay for me

7. The interviewer will go through the pages of a book in time with a previously audio recorded version of the book.

8. The child will be given an option of two snack choices, carrots or cookies, and be asked to choose only one.

9. The child will sort the same 24 pictures of food again into piles of good for me, bad for me, and just okay for me.

10. The child will be shown 6 pictures of children engaging in 3 sedentary activities and 3 active activities and will be asked to choose the pictures that show activities that are good for your body.

11. The child will be given an option of two snack choices, carrots or cookies, and be asked to choose only one

12. The child will be asked two last questions: do you remember the story we read? And what was the story about? This will serve as a manipulation check.

13. The child will be given a small book as a thank you for participating and walked back to their classroom.

Appendix C

Child interview questions:

1. Do you have a TV in your room?
2. What video game units do you own?
3. Where do you eat dinner?
4. Do you eat dinner together as a family?
5. Do you like the taste of food that is good for you?
6. Do you think there are foods that are good for you at home?
7. Do your friends like foods that are good for them?
8. Do your friends eat food that is good for them?
9. Do your parents have rules about food? What are they?
10. What do you think happens if you eat foods that are bad for you?

Sorting task:

Three cartoon pictures of faces will be presented to the child. The pictures are happy, sad, and neutral. I will explain to the child the happy face is depicting someone who just ate something they liked, the sad face depicts someone who just ate something they disliked, and the neutral face shows someone who ate something that was just okay. The child will then be presented with 24 pictures depicting real life food. He or she will be asked to sort the food pictures into 3 piles "like," "don't like," and "neutral" categories. He or she will sort these same foods again into piles of "good for me," "bad for me," and "just okay for me" categories.

Next the children will hear an audio recording while I turn the pages of the story keeping time with the audio recording of either *I Will Not Ever Eat a Tomato* or *Learning about Outer*

Space. After they have heard the story I will give the child two choices of snack, either a bag of cookies or a bag of carrots. They will be allowed to choose one snack.

The child will then sort same 24 pictures of food into piles of "good for me," "bad for me," and "just okay for me" once again. During the last activity I will give the child 6 pictures depicting a child doing various activities. Three pictures show a child doing sedentary activities and three pictures show a child doing active activities. The child will be instructed to choose the pictures depicting children doing activities that are good for their bodies.

As a manipulation check of the experimental conditions, child will be asked two questions:

1) Do you remember the story that you heard before?
2) Can you tell me what that story was about?

The child will then be offered a small book as a thank you for participating and walked back to his or her classroom.