Increasing Healthy Food Choices in Preschoolers using Correspondence Training and Recruiting Natural Communities of Reinforcement

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Increasing Healthy Food Choices in Preschoolers using Correspondence Training and Recruiting Natural Communities of Reinforcement

by

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A thesis submitted in partial fulfillment of the requirements for the degree of Master of Arts
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Dedication

I dedicate this manuscript to my Mother, Father, and Aunt Sharon for their support throughout my academic career, both emotionally and financially. I would also like to dedicate this manuscript to my brother, Aaron, for inspiring me on a daily basis.
Acknowledgements

I would like to acknowledge and thank my advisors, Dr. Trevor F. Stokes and Dr. Debra Mowery. I would also like to acknowledge Dr. Raymond G. Miltenberger and Dr. Frans van Haaren for their support throughout my thesis. Lastly, I would like to acknowledge and thank my research assistant, Kimberly Maynard.
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ABSTRACT

Obesity is a contributing factor to many diseases. Unhealthy food choices are a behavior that can lead to obesity. Teaching children to make healthy food choices at an early age could lead to healthy food choices throughout a lifetime, which would mitigate potential for obesity. A number of different treatments have evaluated healthy food choices in children; however, many did not evaluate or show maintenance effects. The purpose of this study was to utilize correspondence training to acquire healthy food choices in preschoolers and to evaluate of natural communities of reinforcement as a maintenance procedure. Results showed that correspondence training is likely to increase healthy food choices in most preschoolers; however, maintenance of healthy snack choices is variable.
Introduction

Primary reinforcers, defined as food, water, sexual contact, and other events of biological importance, are linked to primary biological functions, which are necessary to sustain life (Skinner, 1953). Although food itself is necessary to sustain life, people choose which foods to consume. Foods high in nutrients, such as fruits and vegetables are shown to aid in the prevention of strokes, cancer, and cardiovascular disease (Gillman et al., 1995; Hu et al., 2000; Liu et al., 2000). In modern Western society data suggest that many people consume fewer fruits and vegetables and more fat based foods than dietary guidelines recommend (Li et al., 2000; Sunbar et al., 1995). In order to influence the food choices a person will make over a lifetime, it is important to begin to change an individual’s eating behavior at an early age (Bijou & Baer, 1961).

Data also suggest that obese children have a high probability of becoming obese adults (Frank, Voors, Schilling, & Berenson, 1977). Therefore, research and treatments pertaining to children making healthy food choices are significant in the applied field because they directly correlate to physical health (Baer, Wolf, & Risley, 1968).

According to Bijou and Baer (1961) people are a product of biology and environmental history. Biology is determined by our genetic composition inherited from our parents, while our environmental history is the source of control of our behavioral repertoires. An individual’s behavioral repertoire develops contingent upon that person’s history of reinforcement and punishment in the presence of specific discriminative stimuli (Skinner, 1953). When behaviors are reinforced or punished in the presence of a
particular stimulus, the behavior is either more or less likely to occur in the future, in the presence of the stimulus; this process is defined as operant conditioning. Respondent conditioning occurs when a neutral stimulus is presented with an unconditioned stimulus that elicits autonomic arousal; the neutral stimulus becomes a conditioned stimulus that elicits a conditioned response (Cooper, Heron, & Heward, 2007). Each person’s response to stimuli in the environment is often an outcome of respondent and operant conditioning (Skinner, 1953). The outcome of operant and respondent conditioning in a child’s food preferences can be assessed and influenced through behavior modification (Bentall, Lowe, & Beasty, 1985).

For example, if a child refuses to eat a specific fruit or vegetable, and there by escape the demand, the child may begin to “hate” fruits and avoid the consumption of vegetables all together. Furthermore, the child may eat a banana and have an allergic reaction, or an aversive event may occur during the consumption of a fruit or vegetable and then the specific food may become a conditioned punisher, which may generalize to other healthy foods. Whatever the circumstances may be, it is clear that there are complex behavioral histories and repertoires in place when it comes to food preference.

Food choice varies from person to person; these variations are often attributed to biological, socio-cultural, and environmental differences (Horne, Lowe, Fleming, & Dowey, 1995). Through assessing acceptance of sugary foods in infants, studies have demonstrated that people have a predilection towards sweet foods (Crook, 1978; Desor, Mallor, & Taylor, 1973). In addition, many of the foods found in modern culture are high in trans-fats, which have been directly related to cardiovascular disease (Hu & Willett, 2002). According to the American Medical Association, diets low in trans fats,
high in omega 3 fatty acids, and fruit and vegetable consumption are optimal diets for preventing coronary diseases.

There are many factors that influence the reinforcing value of food. One of these factors is reinforcer efficacy, which is often defined by the level of the behavior exhibited by the individual in order to attain the reinforcer; therefore, the greater the magnitude, rate, frequency, and lack of latency of a behavior, the greater the reinforcer efficacy (Bickel, 2000; Richardson & Roberts, 1995). However, reinforcer efficacy becomes more complicated when it comes to food, because people are often presented with numerous options. Each option or stimulus has stimulus control over behavioral repertoires, and if there are conflicting consequences, the individual will respond based on previous, contingency history and outcomes (Skinner, 1953).

Another factor that influences the reinforcing value of food are concurrent schedules of reinforcement. According to the behavioral choice theory, when an individual is presented with two choices he or she will choose the item with the highest level of reinforcement (Epstein, Leddy, Temple, & Faith, 2007). However, if response effort is greater for the preferred item, people often choose the less preferred item. The process of a preferred item decreasing in value in favor of another is known as substitutability (Goldfield & Epstein, 2002). Response effort, schedules of reinforcement, magnitude of reinforcement, and delay of reinforcement are all variables that control which behavior will occur when reinforcement is available from multiple behaviors (Miltenberger, 2008). Concurrent schedules of reinforcement play a large role in food choice and are an important variable to address when developing programs designed to influence food choice (Birch, 1990).
In the applied field, many researches assess preference through preference assessments. Many studies on food preference begin with a preference assessment during the baseline phase. During the preference assessment, a minimum of two stimuli are presented to the participant, and they are often told to “pick one.” The stimuli which are chosen first are labeled with the highest preference value (DeLeon & Iwata, 1995). Once baseline levels of choice responding are determined, procedures designed to research the shift of preference are implemented. Shifting the choice of an individual is often accomplished through the application of behavioral cost, where the value of a lesser-preferred food increases based on variables in the environment (Lappalainen & Epstein, 1990). Teasing apart the levels of preference according to behavioral cost is an effective means of measurement; however, it is very time consuming, labor intensive, and requires extensive training. A more user friendly and universally applicable method for determining preference is a questionnaire. Goldstein, Epstein, Davidson, and Saad (2005) developed a questionnaire for assessing the reinforcing value of food.

Many procedures have assessed the effectiveness in increasing healthy food choices. One of these procedures is repeated exposure. Zajonc (1968) conducted a study where data showed that repeated exposure resulted in an increased preference towards visual and auditory stimuli; this is called the “mere exposure effect.” Further research, geared towards taste exposure and preference suggested that increased preference is functionally related to increased exposure (Pilner, 1982). Birch, McPhee, Shoba, Pirok, and Steinberg (1987) assessed the effects of exposure on visual and taste preferences. Data suggested that visual exposure increased visual preference, and taste exposure increased taste preference. The relationship between visual exposure and taste preference
was assessed. The results showed that visual exposure did not lead to increased taste preference; however, taste exposure lead to increased visual preference.

Wardle, Herrera, Cooke, and Gibson (2003) investigated the difference between exposure and rewards on acceptance of unfamiliar foods. The study took place in a London primary school and consisted of 49 children with an average age of six years and seven months old. Sweet red pepper was the target food because 67% of the study participants had not tasted it before and taste tests found it to be lesser preferred. The number of pieces of sweet red pepper eaten served as the dependent variable. There was also a self-report preference component where the children represented their preferences using a scale expressed using cartoon faces (Guthrie, Rapoport, & Wardle, 2000).

Sessions were conducted over 10 school days between 10 am and noon, in a quiet room separate from the class. Students who were assigned to the exposure group were asked to have some red pepper but were not given any demands to do so, nor were rewards delivered. In the rewards phase, interventionists told the children that they would receive a sticker if they ate a piece of pepper. Results from the exposure and rewards groups were compared to a no-treatment control group. Data showed that exposure produced a statistically significant increase in preference. The reinforcement component of the study showed significant improvement in food choice, but it did not demonstrate that exposure was better than reward because there was no statistical significance between the exposure and reward conditions. (Wardle et al., 2003). Therefore, the data did not suggest that exposure was a more efficacious procedure for increasing food preference than rewards.
A good deal of the food consumed by many children occurs in the home; therefore, when designing a program to increase fruit and vegetable consumption, it would be important to take the at-home or parental component into account. Wardle et al. (2003) conducted a randomized trial of children’s acceptance of vegetables using parent led exposure. Parents were either trained on how to expose their child to red bell pepper for fourteen days, given nutritional advice, or were in a control group. Pre and post preference assessments were conducted using the “face” ranking system (Guthrie et al., 2000). Results from the control and information group remained relatively stable from pre-assessments to post-assessments, and the parent led exposure produced a marked increase in taste preference according to the children.

Modeling is another procedure where the effectiveness in changing food choices has been evaluated. Modeling is when a desired behavior is demonstrated for a learner (Miltenberger, 2008). Modeling is an innately social interaction, because there is a model and an imitator. Imitation is one of the earliest skills to emerge during development; therefore it is one of the oldest repertoires (Baer, Peterson, & Sherman, 1967). Due to the strength of modeling repertoires built from imitative repertoires, observed behaviors often serve as a discriminative stimulus to engage in the same behavior (Baer et al., 1967). The desired context for the modeled behavior to occur is the same environment in which it should be taught (Bandura, 1977). Modeling is most effective when the model is similar to the observers or has high status (Bandura, 1977; Hendy, 2002; Hendy & Raudenbush, 2000). Two different mediums can be used for modeling. One method is live modeling, where a person imitates the desired behavior; another is symbolic modeling, where the target behavior is exhibited though multi-media technology,
possibly a cartoon or even a story (Miltenberger, 2008). Many studies utilize modeling prompts, which build upon a person’s imitative repertoire.

Duncker (1938) conducted an early study on the effects of modeling. He showed the relationship between preference behavior and social influences. The study was conducted with two 5-year-old children in a classroom setting. Results suggested that food preferences were altered from non-preferred foods to preferred foods after exposure to peers with varied food preferences, and that preference for food was increased after listening to a story about a food where no previous preference was expressed.

A later study, conducted by Birch (1980) assessed the food preferences of children based on peer and in-vivo modeling in the lunchroom. In-vivo modeling occurs in the environment where the target behavior is exhibited (Miltenberger, 2008). Participants consisted of three 5-year-olds that were separated into two groups based on age. The study was conducted over four days, where the first day served as baseline. Children with different vegetable preferences were paired together, and one child served as the model and the other was the subject. On the first day, the subject chose from the vegetables first, and the model chose first the other three days. Preference was measured based on the food chosen, the amount consumed, and self-report preference based on ranking. Based on these measures, the data suggested that modeling has a strong effect on food preference. Results were the most robust with the three-year-old population.

If a live person does not serve as the model, symbolic modeling can be used. With symbolic modeling, the desired behavior is demonstrated through a medium, such as a story, movie, cartoon, or audiotape (Miltenberger, 2008). Previous studies have shown cartoon characters to be an effective means of modifying behaviors in children.
(Harris & Baudin, 1972). More recent findings also showed that movies featuring peers serve as effective models (Lowe, Horne, Tapper, Bowdery, & Egerton, 2004).

Participants from the Lowe et al. (2004) study were gathered from three primary schools in England, with 402 children in total, ranging in age from four to eleven years old. The study lasted sixteen days, during which time the children watched six 6-minute episodes of a cartoon called the “Food Dudes”. The “Food Dudes” is an adventure-based cartoon where the characters fight against the maniacal “Junk Punks” and are clearly depicted enjoying the consumption of fruits and vegetables. The study was conducted in the natural food environment within the school, which is one of the factors that influences the effectiveness of modeling (Bandura, 1977). Researchers measured consumption of fruits and vegetables. Observers used a five-point scale based on the weight of the food consumed during lunchtime and snack time. Children’s behavior of choosing healthy foods over unhealthy foods was differentially reinforced with “Food Dudes” items contingent on eating fruits and vegetables. Provided that the children ate all of their fruits and vegetables, the teacher delivered a pencil, pen, or pencil case, and if only some food was consumed, the children received stickers. Stickers and sticker cards were also given to parents with instructions to deliver the stickers when fruits and vegetables were consumed. Researchers called the parent’s homes and conducted phone interviews to determine the quantity and variety of fruits and vegetables consumed the previous day. Lunchtime and snack time settings in all schools showed an increase in fruit and vegetable consumption. The most substantial increase was seen in those children who consumed the least amount of fruits and vegetables during baseline, with an approximate 50-60% increase in consumption during intervention. Results from home consumption
also suggested an increase in fruit and vegetable consumption but only on weekdays. A child’s preference rating scale was also assessed, and the data suggested that preference increased during intervention.

A third type of interventions used to increase healthy food choices are reward based interventions. In reward-based interventions, food can be delivered as a reinforcer for a less preferred food, or a reinforcer can be delivered for eating a target food (Horne, et.al., 1995). Both intervention methods seek to employ the process of reinforcement, where the occurrence of a behavior is followed by a consequence that increases the future likelihood of the behavior (Miltenberger, 2008).

One type of reward based interventions are nutrition training and cueing. Stark, Collins, Osnes, and Stokes (1986) examined the effects of nutrition training, which was reward based, and cueing on increasing healthy snack choices in children using a multiple baseline across subjects design. Sessions were conducted in a morning preschool class. Participants included eight children with a mean age of 4 years 4 months. Data were collected during the preschool snack time and in-home 5 days a week. Two healthy and two unhealthy snacks were presented during all sessions. Healthy foods were fruits and vegetables, and common unhealthy foods were cookies and chips.

In nutrition-training, children were taught to use the Epstein, Masek, and Marshall (1978) food coding system. The system was similar to the opposing ends of a traffic light, where red symbolized unhealthy foods—stop and green foods were healthy foods—go. Baseline assessed the pre-intervention choices by allowing children to choose between picture cards and then between the actual items. The children also received stickers contingent upon appropriate sitting and answering questions but not for food choices.
During the nutrition-training phase, stickers and praise were delivered contingent on choosing green foods. Children were first presented with pictures of two healthy and unhealthy foods and asked which one they would pick for a snack. If a green food was chosen, the verbal choice was reinforced, but if a red food was selected, the instructor told the child that red foods are not good for you, green foods are, and the green foods were labeled. The cards were then presented a second time, and the child was prompted to choose a green food. Next, the actual foods in the pictures were presented, and the children chose their snack. The behavior of opting for a green food was reinforced by verbal praise and a reinforcing item. If the child chose a red food, the food was delivered without reinforcement. On the third day of nutrition training, cueing training began. Cueing sentences are positive statements that serve as discriminative stimuli for social reinforcement for appropriate behavior, thus recruiting natural communities of reinforcement (Stokes, Fowler, & Baer, 1978). Once cueing began, instructors started differentially reinforcing behaviors. Stickers were delivered contingent on cueing statements for selecting green foods, while praise was delivered each time green foods were selected. If cueing did not generalize to the home environment, children were given an extra sticker at school if they cued at home (Stokes & Baer, 1977). After the contingent home training phase ended, the maintenance phase began. Maintenance sessions were identical to baseline and lasted for 9 days. The data from maintenance remained at the same levels as the contingent cueing and contingent home training phases, which displayed the children selecting green foods every time.

A second study was conducted to assess the effects of nutrition training alone. Results showed an increase in green food selection; however, data were more variable
and less robust than the first study. The aggregate data of the Stark et al. (1986) study suggested that nutrition training, cueing, and rewards, in tandem with in-home generalization were the most effective procedures when increasing healthy food choice in children. Furthermore, data also suggested that a reward system should remain in place to ensure maintenance of the target behavior. The validity of cueing was strengthened since the data suggested that maintenance levels were likely to return to baseline once tangible reinforcement for a desired behavior was removed (Stark et al., 1986).

Another study assessed nutrition education coupled with correspondence training (Friedman, Greene, & Stokes, 1990). Participants in this study were in the third grade. This study found that nutritional education had little or no effect on children’s food choices, as data from baseline and education were comparable with much overlap. After the nutrition phase, correspondence training was implemented. In correspondence training, the children were asked to verbally choose a snack, after being told that they would receive a reward for choosing a healthy snack and then were taken to another table where the actual snacks were presented. If the children chose a food other than the one they verbally committed to, they were reminded of it and were allowed to choose nutritious or non-nutritious food; however, they only received the reward for the nutritious food choice. Students promptly began choosing the nutritious food in both the verbal and actual food settings. Data suggested that correspondence training was a highly efficient procedure for teaching children to make healthy snack choices.

Lowe et al. (2004) delivered tangible items directly related to the modeling component. After analyzing these studies, it appears that there is a correlation between choice and preference, meaning that a child is more likely to choose a food they have
displayed a preference for. However, preference, as it is assessed in a preference assessment simply shows what a child will choose in a contingency free environment. Choice on the other hand takes more variables into account and therefore can be modified by changing the environment.

Although studies have shown reinforcement to be effective, data do not show whether the healthy food choices will maintain once the delivery of a reinforcer contingent on choosing healthy food is removed. There is a possibility that the behavior will extinguish once the reinforcer is removed (Miltenberger, 2008). Modeling is another procedure that data suggest is effective, however, the effective studies that incorporated modeling also had a component of positive reinforcement built in; thus leaving an implementer looking for long lasting effects without the need of booster sessions. This study hypothesizes that teaching children to recruit natural communities of reinforcement for choosing healthy foods is more likely to produce long lasting positive behavior change.

This study used a multiple baseline across participants and within series reversal phase changes to assess the effectiveness of correspondence training and recruiting natural communities of reinforcement on preschooler’s food choice. First, this study assessed the child’s food preferences using questionnaires and a multiple stimulus without replacement preference assessment (DeLeon & Iwata, 1996). Two healthy and unhealthy foods were chosen for each individual child based on the results of the preference assessment. The healthy foods had a lower level of preference than the unhealthy foods offered in the study. After preference assessments and baseline (BL), the correspondence training (CT) phase was implemented. In the CT phase, the children
were shown pictures of two healthy and two unhealthy foods and were told that if they chose healthy foods, they would be able to pick a prize out of the grab bag. The children then moved to another table and were again asked which food they would like, this time with the food present. The children received any food they chose; however, they were told of their verbal choice after they made their choice at the second table and only received a sticker if they made the same healthy food choice in both environments.

Once the children consistently chose the healthy food at both tables, the recruiting natural communities of reinforcement phase was added. Children were told three different statements designed to evoke praise from an adult, and cueing statement training ended when the child emitted two cueing statements independently during rehearsal. The children were prompted to make the statements and received positive social consequences in response to the statement. This component builds in reinforcement that is available in the natural environment. Because one of the hypothesized reinforcing components of this study was social positive reinforcement, which the child was taught to evoke, it was hypothesized that healthy food choice would be more likely to maintain than it would with tangible reinforcement alone.
Method

Participants and Setting

Participants were typically developing preschoolers, who were recruited from the USF Preschool for Creative Learning. After approval by the USF Institutional Review Board, informed consent was obtained from the children’s parents. The study included 6 children, ranging from 4-6 years of age. Luke was 5 years 3.5 months old and was a Caucasian male. Susan was 5 years 5 months old and was a Caucasian female. Maria was 5 years 2.5 months and was a Latina female. Kevin was 5 years 2 months old and was a Caucasian male. Ivan was 4 years 10 months old and was an African American male. Jay was 5 years 4 months old and was a Caucasian male. The teacher recommended participant without any known food allergies and children with a history of compliance.

Target behaviors

The behavior of selecting a healthy or unhealthy food when given the option of healthy and unhealthy and making independent cueing statements was targeted. Food choice was defined as the first mand (verbal and/or gestural) for one of the foods presented. Food choices were only scored as healthy when the same healthy food choice was made at both tables. Cueing behavior was defined as an affirming statement that a healthy choice was made, followed by a question verifying the statement. Food choice and cueing behaviors were measured as “yes” or “no.”
Preference assessment

The children’s preferences were assessed by the choices observed when offered healthy and unhealthy snacks. To determine which snack options were given to which children, a multiple stimulus without replacement (MSWO) preference assessment was conducted with each preschooler prior to training (Deleon & Iwata, 1996). First the children were presented with an array of six healthy and six unhealthy snacks. The snacks were presented in a random order, and the array was rotated after each food was selected. During the assessment, the children chose one food at a time, and those data were collected on the preference assessment data sheet (Appendix A).

Foods were selected for each participant on an individual basis. The criteria for unhealthy foods selected were that both foods showed higher preference than the healthy foods used in the study. Criteria for healthy foods selected were a preference lower than the unhealthy foods. Results from the preference assessment are shown in Figure 1.
Figure 1. Black bars represent the foods selected for each child and gray bars represent the foods not selected for the study. Each bar graph represents the level of preference shown during a MSWO. A ranking of one suggests the highest level of preference, and a ranking of ten would suggest that the item is less preferred. Items not chosen by participants are not represented on the graphs.
Data collection

Data were collected in the preschool classroom, during the intervention assessments and training procedures. Data collection occurred during the children’s typical snack time and occurred before the participants attended the typical classroom snack. Participants were able to have the classroom snack, if desired following the study snack time.

Two tables were set up for assessment: one had pictures of food and the other had the actual food. At table one, the children were presented with picture cards of two healthy and two healthy snacks. At table two, the children were presented with actual foods in the same array that was present at table one. The sequence of the food presented was chosen randomly for each session, and the order of the foods was keep consistent at both tables.

Inter-observer agreement

An independent observer was present at least 44% of sessions for each participant and collected data during the session. There was 100% agreement between the independent observer and the primary investigator. The number of agreements from the independent observer and the primary investigator were divided by the number of agreements plus the number of disagreements, multiplied by one hundred. Reliability was assessed by the percent agreement between observers for each child’s food choice and vocalization of cueing statements.

Procedures

Researchers from the University of South Florida implemented the study. Prior to baseline, an MSWO preference assessment was conducted with each child. The healthy and unhealthy foods chosen for each child were based on the results of the MSWO
assessment. Foods were selected for each child on an individual basis, and the healthy foods selected showed a lower level of preference than unhealthy foods. Healthy snacks consisted of high fiber, low fat foods (i.e., blueberries, bananas, apples, oranges, kashi cereal, carrots, and grapes). Unhealthy snacks consisted of foods that are high in carbohydrates and fat (i.e., chocolate chip cookies, Oreos, Doritos, potato chips, and Cheetos). Participants were able to choose between 2 items from both categories. Each pair of healthy and unhealthy foods were presented together, on the same side of the display table, and the side that the healthy and unhealthy foods were presented on were alternated throughout baseline and intervention.

Contingent on making healthy food choices and independent cueing statements, the preschoolers received a prize out of the “grab bag.” The “grab bag” was designed to function as a reinforcer. Items placed in the “grab bag” were verbally requested or affirmed by the participants. The “grab bag” contained items such as stickers, pencils, note pads, crayons, etc.

A random numbers table was used to determine the order in which the food pictures would be presented. The order of the actual foods matched the order of the pictures of the foods. The order in which the children participated in the study was based on what time they came to the table for snack time, which was determined by the preschool teacher. Since afternoon snack directly followed naptime and some of the participants napped and others did not, it was not feasible to have the children participate in the snack in a random order.

*Experimental design.* The research design in this study is a multiple baseline across participants design with a within-subject evaluation with reversals of correspondence training. Participants who chose healthy foods during CT entered the
recruiting natural communities of reinforcement phase, and some participants had reversal of these phases as well. Baseline and each training condition had a minimum of three data points. After the initial baseline was stable, correspondence training began. After correspondence training showed stability, there was a return to baseline to examine whether the behavior maintained with correspondence training. If unhealthy foods were chosen for three or more days in CT, the child was moved back the BL. If children began to choose unhealthy foods again in baseline, another phase was implemented. For the three participants that responded to well CT, they were put in the CT+NC phase to assess the maintenance and generalization effects of adding natural communities of reinforcement to correspondence training.

**Baseline.** The room where the training took place was the same in baseline as in treatment and follow-up. There were two tables in the room. The first table the children went to was for the verbal food choice. The children were presented with pictures of the four available snacks for the day and asked to make a verbal choice between them. Directly after the first table, the children were directed to the second table where they were again asked which snack they would like to choose. This time the actual foods were presented on the table in the same placement and grouping of the pictures at the first table. The second table was where the snack was delivered after the choice was made. The investigator said, “Which snack would you like to have? You can pick one”. Regardless of the children’s choices, the investigator respond with “OK,” and the children received the requested snack. Data were collected during the afternoon snack times that are typical in the preschool. The children had last eaten approximately three hours prior to the snack; therefore, no programmed control over the establishing operations was used.
Correspondence training (CT). Prior to CT, each child received instructions and practiced the steps to CT without the actual stimuli present. The first table was where the children verbally said which snack they wanted, and a second table was where they received the actual food. At table one, the children were told that they would receive a reward if they chose a healthy snack, and they were asked which snack they would choose. Then the children went to table two, where the actual snacks were presented and delivered. If the children chose the same healthy foods at both tables, they received that snack and a prize from the “grab bag”. They were told, “You said you would choose (healthy snack chosen) and you did. Good job.” If the children chose the non-nutritious snack, they were told, “You said you would choose (healthy snack) and you did not. That means you do not get to choose a prize.”

Recruiting natural communities of reinforcement (NC). During a session that lasted an average of 15 minutes, in the beginning of the CT + NC phase, the children were told three different cueing statements. Criteria for cueing mastery was reached when a child made two independent responses of cueing statements following a simulated snack time. People in the classroom were not taught to respond to the recruiting statements with praise; however, data were collected on whether the adults responded to a cueing statement with praise or not. “Look, I chose ____, That’s a healthy food, isn’t it”? “I chose a snack that’s good for you, didn’t I”? “This snack will make my body happy, right”? The researcher was present to provide the children with natural communities of reinforcement. If the children did not make a cueing statement independently, they were prompted to do so. If children made unprompted cueing statements they received stickers. If they required a prompt for the cueing statement, they received verbal praise in response to the statement.
Follow-up assessments. The set-up for the follow-up condition was the same as baseline. Three in-situ probes were conducted to assess if the trained behaviors were likely to generalize to other adults, or if it was under the stimulus control of the primary investigator. An in-situ assessment takes place in the natural environment, and the target individual is not aware of the assessment. In this study, the in-situ assessment took place during the typical class snack time at the typical snack table. Two of the assessments were conducted by the main preschool classroom teacher and a novel individual conducted one. The primary investigator conducted two in-situ assessments to assess the investigators stimulus control over the behavior of selecting healthy snack foods.
Results
Out of the six participants, three children made healthy food choices in the initial CT phase, and three did not; therefore, for data presentation purposes, the participants were split into two—responders and non-responders.

Responders. Figure 2 displays the data collected from the participants labeled as responders. Luke was the first participant. In baseline, Luke achieved stability in three days; he was then put into CT and began making healthy food choices, but did not make cueing statements. Baseline and CT were then replicated, showing that CT increased Luke’s behavior of choosing healthy foods. After two replications, there was a return to baseline conditions, and Luke continued to make healthy food choices the first day, but the maintenance was transitory. Then, Luke began the CT+NC phase, which began with some variability in the data, but after three data points, Luke began to show stability in choosing healthy foods and making independent cueing statement for five sessions. Follow-up data promptly fell to baseline levels. Another CT+NC and follow up reversal were conducted, and similar results were shown. Even though correspondence training and cueing were well established in Luke’s repertoire, neither procedure served as a successful maintenance strategy under baseline conditions.

Susan was the second responding participant, and she had three full reversals of CT and baseline phases before CT+NC. In Susan’s first CT phase, there was some variability in healthy food choices in the beginning, but then she began to respond consistently in the following CT and baseline phases. In the CT+NC phase, Susan began to cue independently after the third session and continued for the next five. However,
variability in her data began thereafter, and stability was not achieved before the completion of this study.

The third responding participant, Maria, only had one phase of CT, and she showed consistent and stable responding in CT and baseline conditions. In the CT+NC phase, it took seven days for independent cueing to occur and stable cueing continued thereafter. In follow up, Maria’s behaviors maintained under baseline conditions; however, during the in-situ assessment with the teacher or a novel individual, healthy food choice and cueing behaviors did not maintain.
Figure 2. This figure represents the food choice and cueing behavior of three of the participants displayed as responders. The Closed circles represent food choice and the open squares represent cueing. Breaks in the data show days when each participant was absent during a typical school day. In in-situ phase, the “T” represents the teacher conducting the session and “N” represents a novel person conducting the session.
Non-responders. Figure 3 shows the data collected from the participants labeled as non-responders. With two of the three participants classified as non-responders, correspondence training did not result in a robust change of selecting healthy foods. Kevin responded to CT during the first day of the CT phase in both of his phases but returned to baseline levels for the rest of the days he was in CT.

Ivan began to respond to CT on the third day of his first phase, and the behavior of choosing healthy snacks maintained in BL for four sessions. Subsequently, Ivan’s behavior came under the control of the CT or BL conditions and he began to respond to the changes in independent variables.

Data for Jay show an increase in healthy food choices the first two days of CT, and then a return to baseline levels. Jay only ate three of the healthy foods offered during the preference assessment and one of the healthy foods (kashi) showed higher preference than the unhealthy foods. Jay made statements that he did not like the healthy foods offered, but that if kashi were to be offered, he would choose that food. So, kashi was added in during baseline, yet Jay continued to choose unhealthy snacks. During Jay’s second phase of CT, there was variability in responding, until stability was reached with choosing unhealthy foods. Jay was then put back to BL, and then back to CT, where stable responding occurred for three days, and then became variable once again.
Figure 3. This figure represents the food choice and cueing behavior of three of the participants displayed as non-responders. The Closed circles represent food choice and the open squares represent cueing. Breaks in the data show days when each participant was absent during a typical school day.
Discussion

Consistent with previous studies, the current study showed that CT is an effective intervention for increasing healthy food choices in most children. The current study demonstrated this through an experimental design of a multiple baseline across participants with reversals. Most of the six participants showed that when CT was introduced, it was effective at evoking healthy food choices, but the durability and maintenance of the healthy food choice behavior varied across participants. The three participants displayed as non-responders showed less robust effects of increasing healthy food choices, due to the lack of durability and maintenance.

The three participants who displayed robust behavior change contingent on CT entered the CT+NC phase. The purpose of this phase was to assess the maintenance effects of natural communities of reinforcement and cueing. Results from the maintenance assessment showed variable outcomes. For Luke, healthy food choices and cueing occurred contingent on CT+NC, which suggests that control over healthy food choices failed to transfer from the grab bag to recruiting natural communities of reinforcement. Susan showed durability of selecting healthy foods and cueing in the CT+NC phase for five days, and then her responding became highly variable. Maria’s data displayed the highest level of maintenance. In follow-up, Maria continued to make healthy food choices and cueing statements when the primary investigator conducted the assessment; and this behavior continued during the in-situ assessments. However, when her preschool teacher conducted the in-situ assessment, Maria’s did not choose healthy foods or make cueing statements. Another interesting variable in Maria’s data, is that she
made a healthy food choice, but did not make a cueing statement when a novel individual conducted the in-situ assessment. Therefore, some maintenance effects were shown with Maria, and there was some generalization of healthy food choices across people.

The initial hypothesis from this study was not shown in the results. It was hypothesized that children would begin to make healthy food choices contingent on the correspondence training phase. This response was initially shown in three of the six participants and one participant required numerous sessions of CT to begin responding and two participants did not respond to CT. Furthermore, it was also hypothesized that once children had achieved stability in the CT+NC phase, he/she would continue to make healthy snack choices and cueing statements once the contingency was removed. Data from Maria supported this hypothesis; however, her behavior of selecting healthy snacks and making cueing statements only maintained for the primary investigator. On the other hand, data from Luke showed that his behavior of selecting healthy snacks and cueing did not maintain once the contingency of the grab bag was removed.

Luke showed clear responding to CT and the CT+NC phases, however, the behavior of choosing healthy snacks did not maintain once the “grab bag” was no longer available. One possible explanation for these results is that the “grab bag” had stimulus control over Luke’s behavior of choosing healthy foods. If stimulus control had transferred to the primary investigator, it would have likely been shown following the CT+NC phase, by maintaining the behaviors of cueing and healthy food choices.

Another variable that could have contributed to Luke’s lack of maintenance is concurrent operants. Contingent on the availability of prizes, signaled by the correspondence training statement at table one, Luke chose healthy foods; therefore, the correspondence statement created an establishing operation for getting a prize and healthy food. Without
the establishing operation for the prize, unhealthy snacks were chosen. These results may also suggest that the delivery of a prize following a healthy food choice did not result in an effective pairing and transfer of reinforcing values.

Furthermore, the data suggest that the consequences for selecting healthy foods no longer functioned as potent reinforcers for Susan at session 44. This change in Susan’s data occurred after she returned from a trip to New York, where she missed two consecutive days of school. Personal environmental factors may have contributed to the change in Susan’s behavior. Changes in her environment may have decreased the reinforcing value of the “grab bag” or created an establishing operation for unhealthy snacks. Ultimately, the data show that CT+NC lost stimulus control over Susan’s behavior of selecting healthy foods.

Even though CT+NC lost stimulus control with Susan, it maintained in follow-up with Maria. During the CT phases, the “grab bag” has stimulus control over healthy food selections. Control was transferred to the primary investigator during the CT+NC phase, this stimulus control maintained for the primary investigator in follow-up. However, the stimulus control did not generalize to other people. This was shown in the in-situ assessments, where Maria chose unhealthy snacks.

Ivan was initially a non-responder, and then began to respond to the contingencies of CT. This may have happened if Ivan did not initially respond to the contingencies until he had experienced them numerous times. The data showed that Ivan began to respond to changes in independent variables in the last three phases.

Kevin was one of the participants where a robust change in behavior was not shown. Kevin was absent for three weeks during data collection. In both of Kevin’s CT phases, he chose healthy snacks the first day, but chose unhealthy snacks each day.
thereafter. Data suggested that Kevin’s motivation for the “grab bag” only lasted for one day. Kevin made comments stating that he already got a prize yesterday, and he has the prize at home, and then he would pick an unhealthy snack. Following “grab bag” deprivation (baseline), there was an establishing operation for the “grab bag” and once Kevin accessed the “grab bag”, he became satiated and the previous prize presented an abolishing operation for the “grab bag”, and thus an abolishing operation for selecting healthy foods.

Similar to Kevin, Jay did not achieve stable data of selecting healthy foods in CT, despite changing one of the healthy foods to one he verbally requested. Jay’s motivation to choose healthy foods and the “grab bag” over an unhealthy snack appeared to be variable and his level of satiation typically occurred after two days of responding in CT.

One limitation of this study is in the initial multiple baseline of the responders. Maria was put into CT before Susan’s data achieved stability in CT; therefore, experimental control is not shown through all three replications within the multiple baseline. However, experimental control is shown in Susan’s data through replication between baseline and CT, in her A-B-A-B-A-B-A-C design. Therefore, the combination of the multiple baseline and reversals shows experimental control of the effects of the introduction of correspondence training.

Another limitation to this study was when the primary investigator put Ivan into CT following unstable data in baseline. Upon recognition of this error, Ivan was put back into baseline. Even with this error, Ivan’s data still have experimental control because the baseline and CT phases were replicated in an A-B-A-B-A-B design.

The order in which the children participated in this study was a limitation, because the order was not randomized. All of the children got up from their or her nap at
different times, and the children participated in the study in the order in which he or she sat down at the snack table. However, it is important to note that a randomized order was not used on the request of the teacher, as it would have impeded on typical classroom activities. Randomization of the order in which the children participated would have strengthened the study, however, it was not essential to the experimental control of the study. The multiple baseline across participants and the replication of phases serve as the sources of control, which makes randomization of participants superfluous.

Prior to this study, cueing statements were hypothesized to be the salient stimuli that would cause maintenance overtime; however, those effects were not shown in this study. One hypothesis for the lack of maintenance following CT+NC is that cueing was not strong enough in the children’s repertoire. A more intensive cueing training prior to the CT+NC phase would possibly produce stronger maintenance effects. Requirements for cueing mastery could be use of three different cueing statements in mock choice settings across two researchers with a response rate of 90% or higher.

Another hypothesis for the lack of maintenance following CT+NC is that stimulus control never transferred from the “grab bag” to an adult. Future research could address this by alternating between CT+NC and baseline on a random schedule, followed by thinning the schedule of CT+NC. The intermittent schedule of reinforcement for choosing healthy foods may make the behavior more likely to maintain, since it will be more resistant to extinction. Thinning the schedule of reinforcement (CT+NC) phases may help transfer stimulus control to the adult as the tangible reinforcers are faded.

Furthermore, even if stimulus control transferred from the “grab bag” to the primary investigator, it did not generalize to other adults. Future research would likely benefit from at least two investigators conducting the sessions to program for
generalization. The research task of identifying variables that are likely to lead to long-term maintenance and generalization of healthy food choices in children could prove to be a critical element in improving health outcomes.

Friedman, Greene, & Stokes (1990) and the current study demonstrated that correspondence training is likely to increase children’s healthy food choices; however, variables likely to maintain the behavior have been more elusive. After CT had been introduced and shown to be effective, the maintenance of those changes was not demonstrated in subsequent baselines; therefore, the CT+NC procedure was implemented in a multiple baseline after various periods of CT and BL with the participants. It was hypothesized that teaching children to make cueing statements to recruit natural communities of reinforcement would lead to maintenance and generalization of healthy food choices. While this study did not demonstrate effective maintenance of healthy food choices, it identified variables that may prove crucial in producing long-term behavior change.

The epidemic of obesity in the current population is hypothesized to lead to lower life expectancies in future generations (Olshansky et al., 2005). Obese children are also at a higher risk for kidney failure, type two diabetes, heart disease and stroke (Olshansky et al., 2005). Teaching children to make healthy food choices at an early age could help prevent children from becoming obese, which would likely lead to longer and healthier lives. Therefore, identifying the variables that are likely to lead to long-term healthy food choices are an invaluable addition to society.
List of References


Appendices
Appendix A: Preference Assessment Data Sheet

Order of foods selected (healthy and unhealthy)
1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________
5. ______________________________
6. ______________________________
7. ______________________________
8. ______________________________
9. ______________________________
10. ______________________________
Appendix B: Food Choice Data Sheet

<table>
<thead>
<tr>
<th>Participant:</th>
<th>Foods Offered</th>
<th>Food Chosen from Table 1</th>
<th>Food Chosen from Table 2</th>
<th>Reward Received</th>
<th>Cueing Statement</th>
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