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Preschool Nutrition Education and Influence On Food Neophobia

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PRESCHOOL NUTRITION EDUCATION AND INFLUENCES ON FOOD NEOPHOBIA

by

Kelsey Eller

A thesis submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF SCIENCE

in

Nutrition and Food Sciences

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2012

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ABSTRACT

Preschool Nutrition Education and Influences on Food Neophobia

by

Kelsey Eller, Master of Science

Utah State University, 2012

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Department: Nutrition, Dietetics, and Food Sciences

Food neophobia, the fear of new foods, has been identified as a significant barrier to the intake of healthy foods, including fruits and vegetables in young children. Food neophobia can hinder dietary quality as well as dietary variety by limiting the development of food preferences. It has also been suggested that neophobia is linked to the development of childhood obesity, and due to the escalating epidemic of childhood obesity that is known to be associated with serious health complications, interventions that target food neophobia in preschool aged children may be successful in improving healthy eating habits and potentially reversing the obesity trend.

This thesis includes data collected from the testing of an interactive nutrition education curriculum, *Food Sense Kids*, that specifically targeted neophobia in 3 to 5-year-old children. It was implemented at two child care facilities using baseline and post-intervention surveys and included 51 participants. The curriculum was evaluated on its ability to engage children, be effective across multiple settings, and be easily implemented into a variety of preschool programs. The curriculum was also examined to

determine its influence on food neophobia, food knowledge, and food preferences when implemented in its entirety.

Results indicate that the curriculum was engaging, equally effective across multiple settings, and easily implemented into a variety of programs. In addition, teachers were positive about the program and its effect on their students. Food knowledge increased significantly as a result of participation in the program at both facilities. Overall, no significant changes in neophobia or food preferences occurred as a result of participation in the curriculum. This lack of impact may be explained by not including multiple exposures to each food. Future application of the *Food \$ense Kids* curriculum could include selecting a smaller number of lessons from the overall curriculum to implement over time in order to include multiple exposures to each food, which may lead to beneficial effects on food neophobia and food preferences.

(122 pages)

PUBLIC ABSTRACT

Nutrition Education for Preschoolers and Influences on Consumption of Unfamiliar Foods

by

Kelsey Eller

Researchers from Utah State University are interested in creating a nutrition education program aiming to identify ways to help preschool age children overcome their hesitancy to eat unfamiliar foods, which may give some insight into the prevention of childhood obesity. This research will implement nutrition lessons and snacks designed to engage 3 to 5-year-old children and help them become more familiar with a wide variety of foods from the vegetable, fruit, and grain food groups.

Children from two child care facilities were recruited through parental permission to participate in this study. The children were taught nutrition lessons in the classroom with regular classroom teachers present, and will participate in snacks according to their normal snack schedule. This project seeks to identify the ability of the nutrition lessons to engage children, teach them nutrition concepts, familiarize them with a wide variety of foods, reduce their fear of trying unfamiliar foods, and to determine how well the nutrition lessons could be taught at a variety of child care facilities.

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Kelsey Eller

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CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

ABSTRACT

Food neophobia is a fear of new, unfamiliar foods that is inherent in young children, specifically of preschool age. Food neophobia has been studied in relation to its effects on dietary quality, dietary variety, food preferences, and to a smaller extent the prevention of childhood obesity. Certain factors such as personality traits, age, tactile sensitivity and feeding styles can contribute to the development of neophobia. Strategies such as multiple exposures to a wide variety of foods, social influences and behavior modeling may help to reduce the neophobic response in young children. Child care providers in particular have the opportunity to influence food acceptance, food preferences, and eating habits now more than ever due to the increasing percentage of children who attend full time child care. Some children consume a majority of their daily energy while in child care, emphasizing the responsibility that child care programs have to implement effective nutrition related interventions.

INTRODUCTION

Food Neophobia

Food neophobia is generally defined as the avoidance of or the reluctance to eat foods that are novel or unfamiliar (Dovey et al., 2008; Raudenbush & Frank, 1999). Preschool age children tend to have a relative aversion to new foods while showing a preference for foods that are familiar, bland, and sweet (Wardle & Cooke, 2008). This behavior is very common in childhood, but may also continue into adulthood (Knaapila et

al., 2011). Different children vary dramatically in their willingness to consume foods that are unknown to them, and that degree of neophobia impacts the variety of foods eaten by that child (Raudenbush & Frank, 1999).

It is important to distinguish food neophobia from the similar concept of picky or fussy eating. While the two concepts may seem interchangeable, they have both theoretical and behavioral differences. Food neophobia is the rejection of unfamiliar foods; picky/fussy eating is the rejection of a substantial amount of familiar and unfamiliar foods as well as specific food textures, which leads to the overall consumption of an especially low variety of foods. Ultimately, food neophobia may be described as a subcategory of 'picky' or 'fussy' eating. However, although the two concepts overlap, an increase in one does not necessarily result in an increase in the other. Separate factors predict the severity and expression of food neophobia apart from 'picky/fussy' eating (Dovey et al., 2008).

Neophobia and Childhood Obesity

Childhood obesity is an escalating epidemic in the United States which has led to an alarming increase in serious health complications such as diabetes, cardiovascular disease, and the risk of premature death (De Onis M et al., 2010; Kitsantas & Gaffney, 2010). It is also associated with psychosocial outcomes including low self-esteem, poor academic performance and delayed emotional development (Kitsantas & Gaffney, 2010).

In 2010 it was estimated that 43 million preschool children worldwide were overweight and obese, and 92 million were at risk of overweight (De Onis M et al., 2010). The worldwide prevalence of childhood overweight and obesity increased from 4.2 % in 1990 to 6.7% in 2010, and that figure is expected to reach 9.1%, or 60 million

children, in 2020. When overweight and obesity were considered together the prevalence rate among preschool children was 21.2% (Kitsantas & Gaffney, 2010).

In the United States, the obesity prevalence in two to five year old children increased from 5% to 10% from the early 1970's to 2008 (DGA, 2010). Today, approximately one in four preschoolers is either overweight or obese (Witt & Dunn, 2012). Also, 25.5% of children aged two to five years have a body mass index (BMI) between the 85-94th percentile, and 12.6% have a BMI greater than the 95th percentile. Recent research tells us that children who are overweight as preschoolers are five times more likely to be overweight at age 12 (Matusik & Melecka-Tendera, 2011). One recent study has even shown that the trend toward childhood obesity may begin as early as age six months (McCormick et al., 2010). It is evident from these statistics that early childhood behavioral interventions to prevent childhood obesity are needed.

A link between the prevention of food neophobia in preschool children and the prevention of childhood obesity has been suggested. Food neophobia hinders the development of varied food preferences (Russell & Worsley, 2008). Food preferences play a central role in children's food choices, and evidence is demonstrating that preferences are linked to overall dietary patterns, which influences risk for developing obesity (Birch, 1998). Therefore, efforts to reduce food neophobia may result in progress in the prevention of the current obesity epidemic (Russell & Worsley, 2008).

Child care centers play an important role in the prevention of childhood obesity because the creation of health promoting programs in schools helps children to implement and maintain both healthy eating and physical activity behaviors. In the past, child care settings have been relatively overlooked in the fight against childhood obesity,

but are becoming increasingly important with the realization that children's eating habits are not only shaped at home, but also by the experiences in a school environment (Witt & Dunn, 2012; ADA, 2006).

The following literature review is organized based on information relevant to the overall objectives of this research project.

LITERATURE REVIEW

Food Preferences and Intake in Preschool Children

Current research shows that children over two are not consuming the recommended amounts of healthy foods. Many young children do not eat enough fruits and vegetables, eat too much saturated fat, and take in more energy than they need (Brug et al. 2008). A 2010 study demonstrated that 86% of two and three-year-olds consumed some type of sweetened beverage or sweet or salty snack in a day, and that 68% of two-year-olds and 74% of 3-year-olds consumed some type of dessert or candy in a day (Fox et al., 2010).

In particular, fruit and vegetable intake in preschool children is lacking. The 2010 Dietary Guidelines for Americans recommends approximately one to two cups of vegetables per day and 1 to 1.5 cups of fruit per day for children aged two to five (DGA, 2010). More than 25% of children ages 2 to 3 do not consume a distinct portion of vegetables in a day, and fewer than 15% consume raw vegetables or vegetables that are dark green or deep yellow (Fox et al., 2010). One recent study found that French fries comprised almost 25% of children's consumption of vegetables (Witt & Dunn, 2012). Most children two to three years of age consume the recommended amounts of total

fruits, but children four and older do not. However, greater than half of the total fruit intake for all children over two is consumed as juice (DGA, 2010). Overall, consumption does not align with current guidelines and efforts to improve intake of fruits and vegetables is important in improving the health of children.

Food intake is largely determined by food preferences (Russell & Worsley, 2008). A combination of genetic and environmental factors determines food preferences which directly influences overall food intake in preschool children.

A number of genetic factors have been suggested to influence food intake early in life including heritability of food preferences as well as genetic variations in flavor perception and taste sensitivity (Wardle & Cooke, 2008). Few studies have used large enough sample sizes to demonstrate strong evidence of heritability of food preferences; however, a study conducted in 2006 used a large sample of twins aged four to five found modest heritability for liking desserts, moderate heritability for both fruits and vegetables, and high heritability for protein foods when foods were grouped into those four categories (Breen et al., 2006).

Flavor perception also influences intake because the flavor of food determines its acceptability. The liking for certain taste stimuli is strongly influenced by inborn factors. For example, the taste perceptions of both sweetness and umami are innately preferred while substances that are bitter are generally innately disliked. An innate component is also included in the preference for salty foods, which develops at about four months of age (Beauchamp & Mennella, 2011). Prenatal influences also determine flavor perception. Food choices by the mother transmit flavors and change the flavor of the

amniotic fluid in which a fetus lives, which ultimately leads to increased preferences for those foods after birth (Beauchamp & Mennella, 2009).

Genetic variations in the taste sensitivity of individuals also contribute to differences in food preferences, especially for fruits and vegetables. In particular, sensitivity to specific bitter compounds that are present in many vegetables is determined genetically. Different individuals may find these compounds moderately bitter, intensely bitter, just slightly bitter or even completely tasteless. Children who are highly sensitive to these bitter compounds had lower acceptance of bitter-tasting vegetables like raw spinach and broccoli (Wardle & Cooke, 2008).

While some determinants of food preferences are genetically based, food preferences are malleable, and even negative food preferences can be modified through time and experience (Wardle & Cooke, 2008; Beauchamp & Mennella, 2011). A number of environmental factors may influence the development and modification of food preferences including culture and environment, food familiarity, social facilitation, and food neophobia (Wardle & Cooke, 2008).

Culture can influence food preferences in a number of different ways. Cultural beliefs dictate the age at which certain foods are introduced as well as the appropriate and inappropriate contexts to eat certain foods, such as the time of day that certain foods are eaten. Specific cultures also determine the types of foods that children are exposed to and learn to prefer. Foods that are innately disliked are more accepted by children who grow up in a culture that widely uses those foods. The environment also plays a role in development of food preferences. The local availability and accessibility of certain foods also influences children's preferences for those foods (Wardle & Cooke, 2008).

The degree to which a food is familiar also affects the acceptance of foods in children. Children tend to accept foods with which they are more familiar. For this reason, children are more willing to try an unfamiliar food if it is accompanied by a familiar food (Pliner & Stallberg-White, 2000). Providing children with a number of opportunities to taste a wide variety of novel foods increases their familiarity with those foods and therefore increases both the liking and consumption of those foods (Wardle & Cooke, 2008).

The social environment of children's eating is important in shaping their preferences and intake (Birch, 1998). Social influences can determine the consumption of novel foods and even help children overcome food neophobia. Preschool age children are significantly more likely to consume a novel food if it is also being eaten by teachers and/or peers (Addessi et al., 2005).

Food preferences of preschool children are also strongly associated with food neophobia. Food neophobia hinders the development of a range of food preferences and in turn prevents the consumption of a varied diet (Russell & Worsley, 2008). This neophobic behavior may be reinforced by parents and teachers, who when concerned about the child's overall energy intake, may give in and serve the child the foods that they naturally prefer, which leads to the consumption of only the most palatable foods (Wardle & Cooke, 2008).

However, food intake is not entirely determined by food preferences. Nutrition knowledge, including the ability to identify healthful foods and knowing why to eat healthy can influence voluntary healthful eating. The physical environment, whether it is the school, home, or elsewhere determines the availability and accessibility of certain

healthy or unhealthy food choices. The overall social environment can also influence food intake. For example, choices may be determined by social norms that place an emphasis on healthy eating behaviors or social pressure that exists to engage in unhealthy eating behaviors (Brug et al., 2008).

Food Neophobia in Preschool Age Children

Food neophobia in preschool children is a major barrier to the development of healthy eating habits, but particularly to the intake of fruits and vegetables (Wardle et al., 2005). Therefore, a greater understanding of the predictors and consequences of food neophobia may provide insight for implementation of intervention strategies (Galloway et al., 2003).

Development of Food Neophobia

Young children are inherently reluctant to taste novel foods. Most children exhibit some caution when presented with unfamiliar foods, and up to 30% of children show significant levels of neophobia. However, variation in the degree of neophobia occurs between certain foods and between individual children. Different children also vary dramatically on the types and number of foods they dislike. Specific dislikes can occur even in foods that are widely accepted (Wardle & Cooke, 2008).

The term food neophobia was originally derived from the “omnivore’s dilemma” and was described as an evolutionary behavioral strategy to help children avoid the consumption of poisonous substances. It has been suggested that this behavior is due to neurobiological mechanisms that are present at birth, and that can persist into adulthood (Dovey et al., 2008). This hypothesis suggests that children’s food preferences are

influenced by evolutionary adaptations which are no longer appropriate in the current food environment (Addessi et al., 2005).

The degree to which neophobia is present in preschool children may be determined by the combination of several factors. Personality traits, age, parental attitudes and feeding styles, tactile sensitivity, previous and current experiences with food, and overall willingness to try novel foods are all factors that may contribute to the development of food neophobia.

Some research has characterized food neophobia as an inherent personality trait, which suggests that it is heritable (Dovey et al., 2008). Two recent studies investigating twins demonstrated a strong genetic influence on food neophobia. One study estimated heritability at 78% (Cooke et al., 2007), and the other demonstrating heritability for Finnish and British twins at 69% and 67% respectively (Knaapila et al., 2007), which further supports the hypothesis that reluctance to accept unfamiliar foods is a genetic trait (Wardle & Cooke, 2008). This hypothesis is also supported by research showing that neophobia has been shown to be predicted by certain personality traits. Children who have higher levels of anxiety are more likely to have food aversions and higher food neophobia. Food neophobia is also especially likely to persist in children who are susceptible to anxiety. Higher food neophobia is also associated with the traits of shyness and emotionality (Galloway et al., 2003).

However, some research suggests that an age-specific influence on food neophobia exists and therefore concludes that neophobia may not be a trait at all, but rather an age-dependent state (Dovey et al., 2008). There is evidence that food neophobia is “minimal in infancy, rises rapidly at around the age of two, and gradually decreases

thereafter” (Addessi et al., 2005). Food neophobia may decrease over time because as children age fewer foods are new to them. This suggests that during early childhood, when many foods are unfamiliar, food neophobia is the most detrimental to overall diet (Galloway et al., 2003).

Parental attitudes and feeding styles can also have a significant effect on the development of food neophobia in their children. While parental influence on intake may be limited to childhood, it has the potential to define the magnitude and duration of food neophobia in their children’s lives (Dovey et al., 2008). Neophobic mothers are more likely to have neophobic daughters (Galloway et al., 2003). Also, children’s willingness to taste unfamiliar foods decreases when parents offer the food without tasting it themselves (Carruth & Skinner, 2000). Parents may even be able to influence their children to adopt food habits different from their own. If a child is encouraged to try novel foods through a non-pressured approach, children may learn to accept and even prefer foods that the parent does not like (Dovey et al., 2008).

Another factor that may influence individual differences in the refusal of new foods is sensory sensitivity. Different children vary in the degree to which they perceive and respond to sensory information, and eating involves a variety of sensory experiences including taste, touch, vision, and smell (Coulthard and Blissett, 2009). Therefore, children with sensory or tactile defensiveness, defined as an overreaction or aversion to certain sensory stimuli that most people find harmless, will demonstrate different eating habits and dislikes (Smith et al., 2005). In particular, tactile defensive children may show strong aversions to certain textures, smells, tastes, and even temperatures (Smith et al., 2005), are reluctant to try new foods, and can experience distress, anxiety, and fear about

foods (Angell, 2010). It has been estimated that 15% or more of the total population are sensory or tactile defensive (Smith et al., 2005).

Each child will demonstrate unique food rejection behaviors. Some children will avoid soft textures, while some will avoid rough textures. Some may refuse food that has touched other food, and some will wait until a food item has reached a moderate temperature before eating it (Smith et al., 2005; Angell, 2010).

Sensory sensitivity may also determine food neophobia in relation to fruit and vegetable intake. A recent study concluded that higher taste and smell sensitivity as well as tactile and visual sensitivity were associated with higher food neophobia. Taste/smell sensitivity and tactile sensitivity in particular were also associated with lower overall fruit and vegetable consumption, which may lead to the conclusion that children who are more sensitive to taste, smell, and touch are less likely to eat adequate portions of fruits and vegetables due to the variation in appearance, smell, and taste that naturally occur in those foods (Coulthard and Blissett, 2009).

Breastfeeding duration and intensity in infancy may provide a protective effect against the development of food neophobia. Recent research has shown that exclusive breastfeeding during the first six months of life decreased food neophobia by 75%, food rejection by 81%, and the preference for specific food preparation methods by 78% (Shim et al., 2011). Children who were breastfed are also more likely to accept a new vegetable (Galloway et al., 2003), possibly because breastfeeding allows the infant to learn a variety of flavors through the foods consumed by the mother (Shim et al., 2011).

In addition to breastfeeding, the weaning process also influences the neophobic response. Infants exposed to a variety of different vegetables during weaning were more

likely to accept a new vegetable than infants only exposed to one type of vegetable (Galloway et al., 2003). Alternatively, children introduced to complementary foods besides formula or breast milk before 6 months of age were 2.5 times more likely to be neophobic, and children that were introduced to complementary foods before four months of age were 3.65 times more likely to prefer a limited variety of foods (Shim et al., 2011).

Ongoing experiences with food also have an effect on the neophobia response in children. Neophobia scores are negatively related to a child's exposure to a wide variety of foods between the ages of two and seven, which suggests that early exposure to a variety of foods may reduce the degree of neophobia (Galloway et al., 2003).

The development of food neophobia can also be influenced by a child's general willingness to try novel foods. Willingness to try new foods is associated with having tried a wide variety of foods in the past, and thus children who were not exposed to a wide variety of foods were more likely to be neophobic (Raudenbush and Frank, 1999). Similarly, research has demonstrated that the degree of neophobia is directly related to the degree of familiarity with particular foods. Children are much more willing to try a novel food when it is accompanied by a familiar food than when it is served alone (Pliner & Stallberg-White, 2000).

Willingness to eat a variety of food may also be associated with existing knowledge of foods. Observational studies into children's willingness to try new foods suggest that children use their best guess by comparing the novel food to foods they are already familiar with in order to try and predict its taste. It has also been observed that young children often confuse different fruits and vegetables with each other, indicating that visual and other aspects of unfamiliar foods may not be entirely novel. This suggests

children may conclude that foods that look similar taste similar and therefore prior experiences with familiar foods may reduce their willingness to taste novel foods that appear similar. However, most studies that have been conducted on willingness to try novel foods and food neophobia have demonstrated weak correlations between those two factors (Dovey et al., 2008).

Consequences of Food Neophobia

Research has demonstrated that the presence of food neophobia in young children is associated with negative effects on dietary variety. Food neophobia contributes to lack of dietary variety by affecting the development of food preferences (Russell & Worsley, 2008) and by limiting food selection (Falciglia et al., 2000) and the number and types of foods/food groups accepted into the diet (Fox et al., 2010, Russell & Worsley, 2008).

Food neophobia negatively impacts the variety of children's food preferences. A 2008 study indicated that neophobia was negatively related to preferences for all food groups. Overall, food neophobic children liked fewer foods, disliked more foods, had tried fewer foods, and preferred a narrower range of foods (Russell & Worsley, 2008). Specific groups of foods are more likely to be rejected by neophobic children. Greater levels of neophobia are associated with lower consumption of fruits and vegetables, whereas no association exists for fatty or sugary foods (Wardle & Cooke, 2008).

Food preferences significantly influence dietary patterns; therefore, limited food preferences due to food neophobia may also affect the number and types of foods and food groups that are accepted by children into their diets (Fox et al., 2010). It is well documented that food neophobia has negative effects on the everyday food intakes of

young children. Overall, neophobic children consume fewer types of vegetables, meats, and fruits than their neophilic counterparts (Cooke et al., 2006).

As well as dietary variety, food neophobia also negatively impacts overall diet quality. A study conducted by Falciglia et al. in 2000 found that children with neophobia had a Healthy Eating Index score significantly lower than average and neophilic children, and thus had less overall diet quality. Energy and essential nutrient intakes in this study were comparable between neophobic and neophilic children, except for vitamin E. Fewer neophobic children met two thirds of the recommended intake for vitamin E than neophilic children. Neophobic children also consumed higher amounts of saturated fat and consumed fewer unique types of food (Falciglia et al., 2000).

Food neophobia may also contribute to the development of obesity in preschool children. It is understood that a greater understanding of food neophobia and other factors that underlie food preferences may have important implications for reducing childhood obesity risk (Lumeng et al., 2008). This may be due to the fact that food neophobia is a developmental barrier unique to preschool age that challenges change in dietary patterns of young children (Kuhl et al., 2011). However, little to no research on any direct association between food neophobia and childhood obesity has been conducted.

The prevalence of obesity in preschool children is evidence that unhealthy eating behaviors begin at an early age. It has been shown that usual dietary intakes of two to three-year-old children are high in saturated fat and sodium and low in fiber, which is associated with increased risk of chronic disease (Fox et al., 2010). High intakes of saturated fat along with low intakes of fruits and vegetables have been linked to obesity (Schickenberg et al., 2007). Therefore, it may be hypothesized food neophobia and the

narrow dietary variety associated with it may be a determinant in the development of early childhood obesity.

A genetic basis of food neophobia may play a role in the development of early childhood obesity. Bitter taste perception is largely mediated by genetics, and may affect intake and food preferences in young children. The ability to taste the bitter compound 6-n-propylthiouracil (PROP) is specifically associated with food neophobia, and may also be associated with the development of obesity. Many studies have demonstrated an association between PROP tasters and food aversions, dislike for vegetables, and lower consumption of vegetables. Preschool children who are PROP tasters have been shown to consume fewer vegetables overall (bitter and non-bitter) than children who do not taste PROP. However, the association between PROP tasters and obesity may exist only for low-income children (Lumeng et al., 2008).

Two studies conducted in 2002 and 2006 have not shown a strong association between the ability to taste PROP and BMI (Lumeng et al., 2008). One 2004 study concluded that there was a gender difference, with PROP taster girls having higher BMIs than non-tasters while boys showed no such association (Keller & Tepper, 2004). However, all three of these studies were conducted with children who were predominantly white with middle to upper socioeconomic status where the prevalence of overweight in preschoolers is low (Lumeng et al., 2008). Low income children however often do not have access to or are not offered a wide variety of vegetables and have more exposure to fast-food and other foods high in energy density. Thus, low income children who are also PROP tasters may have a particularly low consumption of vegetables and consequently a higher risk for overweight. A PROP study conducted with low income

children in 2008 found that PROP sensitivity was directly associated with a higher BMI z-score (Lumeng et al., 2008).

Treatment of Food Neophobia

Food neophobia is a trait that if managed through behavioral interventions can be overruled. For although humans are naturally inclined to prefer certain tastes and be suspicious of novel foods, we also are predisposed to learn by experience (Wardle & Cooke, 2008), so taste and food preferences may be learned and unlearned through time and experience (Brug et al., 2008). For example, individuals can lose the aversion to bitter taste and learn to enjoy foods, especially vegetables, which are mainly bitter (Dovey et al., 2008).

It is critical for acceptance of a wide variety of foods to occur very early in life because childhood food neophobia may have detrimental effects on fruit and vegetable intake as well as overall healthy eating habits which may persist throughout childhood and even into adulthood (Knaapila, 2011; Dovey et al., 2008). A fairly recent longitudinal study demonstrated that the number of liked foods does not change significantly between the ages of two and three to age eight, which suggests that food neophobia present in preschool age can have a strong influence on food preferences into school age (Skinner et al., 2002). Another study demonstrated that seeking to consume a variety of foods tracked from the ages of two to three until early adult life, and that food neophobia in adulthood was significantly predicted by seeking food variety at ages two to three (Nicklaus et al., 2005).

Many strategies exist that may help to reduce the neophobic response in young children (Cooke et al., 2006). These strategies may include exposure to a wide variety of

foods, multiple exposures to tastes as well as social influences and behavior modeling, and the use of rewards. Overall, intervention strategies should focus on modifying food preferences and improving the food environment in order to diminish the neophobic response in young children.

There may be an instance in which the degree of food neophobia may be minimized from infancy and therefore would not require in-depth strategies in early childhood. New research has suggested that the introduction of complementary foods too early in the weaning process increases the probability of having food neophobia and a limited diet in young children. Specifically, introduction of foods before six months of age increases the chances of developing gastrointestinal (GI) discomfort and food allergies because the GI system has not yet fully developed. This can increase the negativity of experiences with foods, which increases the likelihood of developing food neophobia in the future (Shim et al., 2011).

Exposure to a wide variety of foods in preschool age is associated with greater willingness to try new foods (Raudenbush & Frank, 1999). In fact, research has repeatedly shown that multiple opportunities to sample unfamiliar foods increases consumption of those foods as well as the preference for those foods (Wardle & Cooke, 2008). Recent research has also shown that frequent exposure to novel foods is necessary to enhance acceptance (Freedman & Alvarez, 2010). Additionally, frequent exposure to a wide variety of foods may improve diet quality and lead to healthier eating habits (Wardle & Cooke, 2008). This is especially beneficial because the consumption of a varied diet ensures adequate consumption of essential nutrients that reduce risk for chronic disease and contribute to optimal health (Falciglia et al., 2000). Therefore,

exposure to a wide variety of foods early in life is a simple technique that may be used to increase vegetable preferences in young children (Wardle & Cooke, 2008), and behavioral interventions that focus on this practice may succeed in diminishing food neophobia altogether (Dovey et al., 2008).

These exposures must also occur multiple times in order to have an effect on children's eating behavior (Addessi et al., 2005). Research has indicated that at least 10 to 15 exposures are needed to produce significant increases in liking for unfamiliar foods in preschool children (Birch et al., 1987). In order for these exposures to work effectively, novel foods must be tasted rather than merely seen (Coulthard & Blissett, 2009). Research has demonstrated that children's dislike of a food is strongly negatively correlated with tasting that food (Wardle et al., 2001).

In addition to taste exposures being repeated multiple times, they must also be positive experiences in order to lower children's reluctance to taste novel foods. The fear reaction that is initiated by neophobia is by nature a negative experience, which when in combination with negative emotions or a negative environment from the adult feeder will create a larger negative experience to overcome for the child (Dovey et al., 2008). If an overall positive atmosphere is created, children's food acceptance is enhanced (Hendy & Raudenbush, 2000).

Social context and behavior modeling are also important interventions to apply in the treatment of neophobia because the eating behaviors of young children are affected by social influences. The social context in which food is encountered can promote the ready acceptance of novel foods (Addessi et al., 2005). For example, the simple act of

observing others eating specific foods increases the likelihood of consumption of those foods which can directly change food preferences (Wardle & Cooke, 2008).

Modeling in particular is a social behavior that can reduce or even reverse the effects of neophobia and enhancing children's novel food acceptance (Wardle & Cooke, 2008; Addessi et al., 2005). The positive impact that modeling has on children's food choices is well documented in the literature (Wardle & Cooke, 2008). Children observe adults model a behavior, take that behavior into account and act accordingly. In particular, one research study demonstrated that children will copy a model's eating behavior when their foods are the same color, but not when models have a food of a different color (Addessi et al., 2005).

Food neophobia in children can be either decreased or increased depending on the degree of neophobia present in the models. Models who are neophilic can affect reductions in neophobia, whereas models that are neophobic may actually produce increases in neophobia (Hobden & Pliner, 1995). Additionally, modeling is only effective at encouraging food acceptance when it is enthusiastically done. Silent teacher modeling is not effective at increasing the consumption of either unfamiliar or familiar foods. The impact of enthusiastic modeling may be beneficial because it makes novel foods seem safer to children when the model is familiar with them and refers to them by name, and also the overall food environment becomes much more positive when teachers are enthusiastic (Hendy & Raudenbush, 2000).

The concept of using rewards as a method to increase children's food acceptance is also worth mentioning because it is a technique that may be commonly used when feeding children.

Rewarding children for food consumption may modify children's view of the acceptability of that food, and it may also promote consumption in the short term. Giving rewards for consuming foods intrinsically involves taste exposure to the food, and exposure enhances liking of foods. However, somewhat counter intuitively, research has demonstrated that rewards actually act to limit the positive effects of exposure (Wardle et al., 2003b).

Exposure without reward results in a slow, steady increase in taste preference and consumption. Rewards initially produce a swift increase in consumption, but thereafter do not result in any significant increase. This tells us that rewards do not result in steady increases in consumption, but may be highly effective in the short term. However, an inherent problem with the use of rewards is their ultimate withdrawal, which can lead to the loss of the acquired eating behavior (Wardle et al., 2003b). Rewards may also undermine a child's intrinsic motivation to consume a food which decreases the desired behavior in the future, but some have suggested that individuals in general do little without some form of extrinsic motivation, and so if the promise of a small non-food reward results in a taste exposure in a highly neophobic child then that may be a step that is necessary to increasing food acceptance (Wardle & Cooke, 2008).

Ultimately, rewards for food consumption may reduce food acceptance by changing the way that the child perceives why he or she eats food. It seems unnecessary to use rewards especially when research has demonstrated that the simpler method of offering choices and letting the child control their portion size and intake works just as well (Hendy, 1999).

Role of the Child-Care Provider

The use of child care outside of the home is now the norm for families in the United States (ADA, 2011). Currently, about 82% of children younger than six years of age are in care outside of the home (Briley & McAllaster, 2011). Nearly nine million children attend child care, with the majority of those children spending more than 15 hours per week in child care (ADA, 2011), and 41% of all preschool children are in child care for 35 or more hours per week (Witt & Dunn, 2012). As a result of this shift, child care centers are in a position to greatly influence food preferences and intake of preschool children (Brug et al., 2008) because they have replaced the family table as the environment where young children learn food habits (Briley & McAllaster, 2011).

Child care providers, including preschools, day care centers, family child care homes, and Head Start programs among others have an important role in shaping the health of the children in the United States. Child care providers have the opportunity to influence eating habits, food preferences, overweight and obesity, as well as growth and development in preschool children and ultimately help to establish healthy habits that will continue into adolescence and adulthood (ADA, 2011). With the need for care outside of the home increasing, child care providers must establish interventions in the nutrition-related components of their care in order to improve the overall diets of children in America in order to help to reduce the impact of childhood obesity (Briley & McAllaster, 2011).

Nutrition and obesity prevention

The foods that are eaten in early childhood can have a lasting effect on physical, emotional, and cognitive development (Hendy, 1999). Healthy eating patterns are also

acquired in childhood and continue into adolescence and adulthood (ADA, 2011).

Consequently, it is imperative that child care centers emphasize nutrition related interventions in order to promote increased consumption of nutritious foods as well as the development of healthy eating habits early in life. Caregivers should offer a wide variety of fruits and vegetables of different colors and textures, whole grains, low-fat dairy products, and limit foods and beverages that are energy-dense and nutrient-poor. Snacking should be limited and focused on nutritious foods, and water should be given as the favored non-milk beverage (Fox et al., 2010).

Child care providers have the opportunity to establish and reinforce healthy eating habits in preschool children (Dunn et al., 2006) through nutrition instruction and food sensory experiences and by providing nutritious meals and snacks. Nutrition education can be implemented daily into child care settings through several different formal and informal methods which may include books, posters, interactive lessons, hands-on activities, and mealtime or snack time conversations. These lessons should provide children with a basic understanding of the origin of food (ADA, 2011). These messages should also be consistent with messages that are conveyed in other community settings in order to best promote healthy eating behaviors (Larson et al., 2011). Caregivers can also help teach children about food by providing food sensory experiences. When children are allowed to taste, smell, and manipulate foods, they are more likely to eat them, especially with repeated exposure (ADA, 2011).

Preschool children that attend full time child care programs may consume up to 75% of their daily dietary requirements while in care (ADA, 2011), which places a large responsibility for nutrition education on the caregiver. The child care provider must

ensure that children are offered a variety of nutritious meals and snacks to promote healthy eating habits (Briley & McAllaster, 2011) and optimal growth and development for the formative years of childhood. Child care centers should ultimately seek to achieve recommended benchmarks in early childhood nutrition by providing a safe, sanitary, supportive environment (ADA, 2011).

However, many child care providers lack knowledge and training in nutrition and educational materials in order to teach children about healthy eating and physical activity (Dunn et al., 2006). Seeking guidance from food and nutrition professionals is key to allowing caregivers to help children develop healthy behaviors (Benjamin et al., 2008).

Healthy eating and nutrition education for preschool children are important interventions that may help reverse the current obesity epidemic (Briley & McAllaster, 2011). Currently, few studies on the connection between child care settings and obesity prevention have been conducted (Koleilat et al., 2011). A study in 2005 found that limited child care attendance was associated with decreased risk of obesity compared to no attendance (Lumeng et al., 2005). A 2007 study that took a national sample of three-year-old low-income children did not find an association between child care and obesity (Kimbrow et al., 2007). A 2008 study found child care was protective against obesity only in Hispanic children (Maher et al., 2008). A 2011 study conducted with low-income, mainly Hispanic preschool children who participated in the Women, Infants, and Children (WIC) program in Los Angeles County, California, found preschool enrollment for 4 or more days per week was associated with lower odds of obesity independent of socioeconomic status, maternal BMI, and quality of the child's home environment (Koleilat et al., 2011).

Child care providers must take the opportunity to improve the nutritional quality of food provided to children, increase the amount of time children are involved in physical activity, and promote healthy behaviors through the use of educational resources. Obesity prevention interventions that focus on nutrition, physical activity, and improving weight outcomes have been designed for child care centers, preschools, and Head Start programs, but no such interventions have yet been designed specifically for family child care homes. Interventions especially need to focus on low-income and minority communities, because the prevalence of obesity is considerably higher in those populations (Larson et al., 2011).

Caregiver and family interactions

Interactions between child care providers and families are incredibly important because as more parents rely on providers for feeding their children, there must be open communication between providers and families about the meals, snacks, and beverages served to children. Providers can communicate with parents about nutrition education that takes place in the child care setting in order to help parents communicate nutrition information to their children (ADA, 2011).

Because parents directly influence the eating behaviors of their children, child care providers must educate parents and support them in making nutrition related decisions. This interaction is paramount in reversing the trend of obesity in preschool children (Briley & McAllaster, 2011). Child care programs can partner with nutrition professionals to provide nutrition training to families to help ensure that nutrition messages are consistent between the child care setting and the home (ADA, 2011). Guidance from nutrition professionals can be especially helpful, especially because both

caregivers and parents tend to overestimate the quality of children's diets. This guidance can also ensure that nutrition messages are useful for the child care setting and practical for busy families (Fox et al., 2010).

*Regulations and guidelines for feeding children
in the child-care setting*

There is no national nutrition policy for all part-time child care providers (Van Horn, 2011). Child care centers are primarily regulated by states, with each state being allowed to establish its own regulations for child care facilities and then set minimum requirement standards (Larson et al., 2011). State regulations vary between child care centers and family child care homes (Larson et al., 2011) as well as between small and large family child care homes (Kaphingst & Story, 2009). Cities and individual child care may also add individualized regulations, but must ultimately meet state requirements (Kaphingst & Story, 2009). With each state creating its own regulations for child care facilities, the nutrition standards and enforcement of those standards vary considerably, especially with regard to the amount, type, and quality of foods offered (Van Horn, 2011).

States most commonly require child care providers to follow the Child and Adult Care Food Program (CACFP) (Kaphingst & Story, 2009), which is a federal program that provides reimbursement for meals and snacks to eligible child-care programs (Benjamin et al., 2010), with the rate of reimbursement varying depending on the type of child care program (Larson et al., 2011). The CACFP provides nutrition education, controls meal patterns and portion sizes and also offers sample menus to assist compliance to nutrition standards (ADA, 2011). Eligible programs may include non-profit or for-profit child care

centers, after school programs, Head Start programs, or day care centers (Kaphingst & Story, 2009). Child care homes can participate in CACFP, but must work with a sponsoring agency to do so. Child care programs that are not able to use CACFP are encouraged to follow CACFP guidelines (ADA, 2011).

Regulations on nutrition and healthy eating vary among the states. A study in 2009 found that no state licensing regulations mandated that child care facilities meet specific nutrient based standards. Only two states required that the menus of child care centers be consistent with recommendations from the Dietary Guidelines for Americans. Only 12 states for child care centers, seven states for large family child care homes, and four states for small child care homes had limitations on the amount of foods of low nutritional value that can be served (Kaphingst & Story, 2009).

Nutrition regulations are more common for child care centers than for family child care homes. As of 2006, 60% of states specified CACFP or similar requirements for child care centers, while 50% did for large family child care homes and 40% did for small family child care homes (ADA, 2011).

Overall, the meals, snacks and beverages given to children in child care programs should provide the required nutrients proportional to the time spent in the care setting. Children who attend part-time should be provided at least one third of the daily nutrient requirements, and children who attend full-time should receive half to two thirds of their daily nutrient needs while in the care setting (ADA, 2011).

Adherence to state regulations on nutrition and healthy eating is a major concern in the United States, especially due to the rising prevalence of obesity in young children. Levels of fat, sodium, and fiber served to children should receive particular attention

(Crepinsek et al., 2009). A 2009 study found that a significant portion of family child care homes did not meet standards for nutrition, specifically through limited servings of low-fat milk, regular servings of 100% juice, common use of unhealthy foods for celebrations, limited nutrition training, and no written nutrition policy (Trost et al., 2009). Other studies on family child care homes have found similar concerns, including meals and snacks that exceed the recommended limit for saturated fat, a third of snacks and breakfasts do not include a fruit or vegetable, low-fat milk is served rarely, and children often receive sweet snacks (Larson et al., 2011).

Ultimately, all types of child care settings should offer children a wide variety of foods including fresh fruits and vegetables, whole grains, low-fat dairy products and healthy fats. Consumption of energy-dense foods that are low in nutrients should also be limited because preschool children have high nutrient needs and relatively low calorie requirements, which leaves little room for those types of foods and beverages (Fox et al., 2010). Head Start programs, which are regulated by federal standards, provide a model for nutrition performance standards that family child care homes should strive to mimic. Nearly all Head Start programs place a focus on healthy foods and have implemented additional nutritional practices beyond requirements (ADA, 2011).

Child care centers and family child care homes should seek to exceed the nutrition standards that are given through state regulations and strive to be consistent with the Dietary Guidelines for Americans. It is recommended that children should consume five or more servings of fruits and vegetables per day. Fruits and vegetables should be minimally processed and preferably served raw which increases dietary fiber and prevents loss of nutrients. Frozen or canned fruits and vegetables are also good options.

Juice consumption should be limited to less than four to six ounces per day because children are likely to consume juice at home and excess juice consumption can contribute to obesity. A focus should also be placed on providing whole grains as well as consumption of 1% or skim milk for children older than two years of age. Child care providers should also follow portion size recommendations and encourage children to follow hunger and satiety cues (ADA, 2011).

Regulations and guidelines for physical activity should also be mentioned because activity is a critical piece in obesity prevention. It is recommended that young children should accumulate 60 minutes of physical activity per day (ADA, 2011). While 36 states require activity time for child care centers, only nine states have minimum lengths of time that children should be outdoors each day (Kaphingst & Story, 2009). Multiple studies have concluded that activity levels in child care is quite low, children rarely get 60 minutes of physical activity, children are largely sedentary, and physical activity levels vary substantially depending on the childcare facility (Larson et al., 2011).

Providers can help facilitate physical activity by creating opportunities for children to participate in physical activity and by encouraging time spent outdoors. Limiting sedentary time such as prolonged sitting and screen time is also important (ADA, 2011). Teachers and other caregivers can promote activity in children by being active themselves, because research shows that sedentary behavior of caregivers contributes to sedentary behavior in children, especially girls (Larson et al., 2011).

Influence of child care providers on food neophobia, preferences, and acceptance

The preschool years are particularly important for nutrition intervention to occur because children are developing eating skills and learning to accept a variety of new foods. Child care providers therefore have a valuable opportunity to influence food consumption, food acceptance, the development of healthy eating habits and even assist in obesity prevention in young children by creating a supportive eating environment (Larson et al., 2011). Some researchers have even suggested that providers have the opportunity to influence the food acceptance patterns of a generation (Hendy, 1999).

Limited research has been conducted on the direct impact child care providers have on feeding behaviors of young children (Briley & McAllaster, 2011). However, there are several methods that providers can implement to create a supportive, interactive eating environment that may improve children's acceptance of a wide variety of healthy foods. These include creating a positive atmosphere, understanding the division of feeding responsibility, offering choices without forcing eating, helping children listen to hunger and satiety cues, involving children in food sensory experiences, providing multiple exposures to different foods, behavior modeling, respecting cultural differences, providing nutrition education, and seeking training and guidance from nutrition professionals.

The environment in which novel foods are presented to children in child care settings can influence the development of lifelong food habits (Briley & McAllaster, 2011). Novel foods that are presented in a friendly, positive manner can influence food acceptance and food preferences (Brug et al., 2008), while foods presented in a negative

mealtime environment may facilitate unhealthful eating behaviors (ADA, 2011). In fact, both willingness to try new foods and the reluctance to try new foods are strongly associated with positive and negative experiences, respectively. Children's neophobia should be treated with sensitivity, because negative experiences with food can lead to dislike and act as a barrier to multiple exposures in the future (Tuorila & Mustonen, 2010)

When feeding young children it is also important to offer children choices and refrain from forcing consumption of certain types and amounts of food. It has been reported that 75% of child care providers make children eat foods they think are good for them, with slight differences in ethnicity. One study found that 85% of Hispanic providers, 69% of Asian providers, and 44% of white providers use this behavior (Freedman & Alvarez, 2010). Adults who are forceful and insist that children eat produces negative effects on eating and can lessen food acceptance (Hendy, 1999). Forcing or pressuring children to eat can also lead to increased neophobia, picky eating, resistance to eating, dislike of certain foods into adulthood, lack of intrinsic interest in consuming novel foods, struggles during meal and snack time, and a reduced ability to regulate energy intake which contributes to overweight and obesity (Wardle et al., 2005; ADA, 2011; Hendy, 1999; Satter, 1995; Freedman & Alvarez, 2010). It has also been demonstrated that a negative association exists between control over eating and fruit and vegetable consumption (Wardle et al., 2005). Also, when children were not offered a choice between vegetables at meal-time, vegetable consumption decreased (Zeinstra et al., 2010).

Alternatively, when children were given a choice of whether to eat, how much to eat and allowed the opportunity of food refusal, their enjoyment increased (Zeinstra et al., 2010), they were more likely to sample new foods, and food acceptance increased (Hendy, 1999). Choice-offering is one of the most effective mealtime actions that child care providers can implement to help children overcome neophobia and develop intrinsic motivation to eat a variety of foods, behaviors which may last into adolescence and even adulthood (Hendy, 1999). However, one study demonstrated that choice-offering before a meal was not associated with increased liking or consumption for vegetables, so multiple opportunities where choices are given may be required to have a significant effect on vegetable liking and consumption (Zeinstra et al., 2010).

Child care providers must also understand the division of responsibility that is recommended when feeding young children. Recent research has found that child care providers feel strongly that they have a responsibility to regulate how much children eat (Freedman & Alvarez, 2010). However, when adults attempt to control children's eating, it can distort children's eating behaviors, lead to resistance to eating and interfere with learning to like a variety of nutritious food. Ultimately, adults are responsible for choosing appropriate food, providing structured meals and snacks, and creating a pleasant eating environment (Satter, 1995). Caregivers must be the gatekeepers to the types of food that are available to children, and ensure that a variety of healthy, nutritious foods are available (Johnson, 2000). Children should be given control over how much and even whether they eat what is presented to them (Satter, 1995). It is theorized that this division of responsibility approach may help children to learn to self-regulate intake (ADA, 2011).

A recent study demonstrated that child care providers make very few comments cuing children to listen to their hunger and satiety cues during meal and snack time (Larson et al., 2011). Child care providers need to encourage children to understand and listen to their internal cues of hunger and satiety. Data has consistently demonstrated that young children have the ability to optimally regulate the amount of food they consume in non-controlling situations (Johnson, 2000). Young children are also aware of their feelings of hunger and satiety, but can lose that ability by age five when they learn to pay attention to portion size rather than physiological cues (ADA, 2011). There are large individual differences in children's ability to self-regulate intake (Birch, 1998), and these variations are associated with child feeding practices (Johnson, 2000). When providers attempt to control how much children eat, it teaches the child to pay attention to the amount of food left on the plate rather than listening to internal physiological cues of hunger and fullness (Birch, 1998).

Providing hands-on food sensory experiences that allow children to taste, smell, feel, see, and hear the food as it is being eaten, as well as assist in food preparation is also an effective strategy to decrease food neophobia and increase food acceptance (Connecticut State Department of Education, 2001). Sensory experiences with food are important because the sensory properties of foods are the primary basis for liking (Raudenbush & Frank, 1999). A study in 2008 found that sensory education can influence food neophobia in young children, but the effect is only temporary (Reverdy et al., 2008), which may suggest that sensory education should be ongoing.

Research has repeatedly demonstrated that providing children with multiple exposures to novel foods can change children's food acceptance behaviors (Addessi et

al., 2005). Child care providers have the opportunity to provide multiple exposures to a large variety of foods through daily meals and snacks. Caregivers must recognize that they may be able to provide the number of new exposures to new foods to children that parents are not willing or able to provide (Wardle et al., 2003a) due to modern day time constraints (Dovey et al., 2008). However, recent research demonstrates that 46% of child care providers only cook food that they know children like, with this practice being three times more likely to occur in Hispanic providers than Asian or white providers. Providers also rarely offer a food more than three to five times although it has been demonstrated that 90% of providers knew children may need to try foods several times before liking occurs (Freedman & Alvarez, 2010).

Modeling healthy eating behaviors is also an effective strategy for helping children try new foods (Freedman & Alvarez, 2010), supporting healthy eating habits and increasing food acceptance in preschool children. Recent research has shown that caregivers support healthy eating by sitting with the children, eating the same foods, talking with children about trying and enjoying healthy foods and providing encouragement when modeling eating behaviors (Larson et al., 2011; Briley & McAllaster, 2011). In fact, research also shows that children may eat a larger variety of foods if teachers routinely eat with them (Addessi et al., 2005). Research has also shown that family-style meals where children are allowed to serve themselves and choose their own portion sizes encourages healthy eating and supports better self-regulation of intake (ADA, 2011). Children should be allowed to choose their portion sizes because portion sizes chosen by adults that are too large may produce excessive intake at meals and create

an environmental influence that can lead to overweight and obesity (Orlet Fisher et al., 2003).

The child care setting may also be an ideal setting for encouragement of food acceptance because of its social nature. A 2005 study demonstrated that peer models may actually be more effective models than teachers for eating behaviors, and that food acceptance may be increased in social situations like preschools due to the simultaneous influences of social context and repeated exposure (Addessi et al., 2005).

Child care providers must also recognize that cultural differences exist in food preferences and food familiarity, and those differences should be respected. Incorporating cultural differences by teaching children about foods from several cultures and sampling those foods can influence the development of a healthier, more varied diet into adulthood (ADA, 2005). In fact, some research has even shown that exposure to different cultures may be negatively associated with food neophobia (Flight et al., 2003).

The child care setting is ideal for implementing nutrition education. Young children need to learn about food, nutrition, and the link between nutrition and health (ADA, 2005). A recent study found that nutrition knowledge was positively related to daily fruit and vegetable intake (Brug et al., 2008). Children can learn about food and nutrition from caregivers (ADA, 2005). However, a recent statistic suggests that only 47% of caregivers provide nutrition education apart from mealtime (Larson et al., 2011). Ideally, meals and snacks would be integrated with developmentally appropriate nutrition related activities (ADA, 1999; ADA, 2005).

In order to provide accurate and appropriate meals, snacks, and nutrition education, providers should seek guidance and training from nutrition professionals.

Research shows that only half of caregivers in both child care centers and family child care homes know good food sources for specific nutrients or understand appropriate portion sizes for vegetables for preschool children (ADA, 2005). Unfortunately, less than half of family child-care providers receive any annual training in nutrition (Larson et al., 2011). It is important that providers seek training because limited nutrition knowledge can place children at risk (ADA, 2005). Nutrition professionals can help child care providers in translating knowledge into behavior (Freedman & Alvarez, 2010).

Research questions and objectives are included below and are organized according to the intended outcomes for this research project.

RESEARCH QUESTIONS

1. Is curriculum that involves nutrition education and food sensory experiences effective at reducing food neophobia in preschool children?
2. Is this nutrition curriculum effective at increasing children's knowledge about foods?
3. Does this nutrition curriculum affect preschooler's food preferences?
4. Is *Food Sense Kids* effective at engaging preschool children?
5. Is *Food Sense Kids* equally effective across multiple settings?
6. Would *Food Sense Kids* be easily implemented into a variety of preschool settings?
7. What are some best practices that should be apply when implementing a nutrition curriculum to preschool children?

OBJECTIVES

1. Reduce food neophobia and increase acceptance of new, unfamiliar foods in preschoolers.

2. Increase exposure to and knowledge of a wide variety of new, perhaps unfamiliar foods in preschoolers.
3. Encourage healthy eating and active lifestyles at a young age.
4. Create a nutrition education curriculum that is effective and easily implemented by a variety of preschool nutrition programs.
5. Illuminate best practices to apply when implementing a preschool nutrition curriculum.

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CHAPTER 2

PRESCHOOL NUTRITION EDUCATION AND INFLUENCES ON FOOD NEOPHOBIA

ABSTRACT

Objective: To examine the influence that *Food Sense Kids*, an interactive Supplemental Nutrition Assistance Program-Education (SNAP-Ed) nutrition education curriculum designed for preschoolers, has on food neophobia.

Design: Data were collected at baseline and post-intervention.

Setting: Four preschool classrooms at two preschool care centers in a city in the Western United States.

Participants: Preschool children (n=51) aged 3 to 5.

Main Outcome Measures: Evaluation of a Child Food Neophobia Scale, Food Preference Survey, and post-intervention survey.

Analysis: Data were analyzed using mixed models analysis.

Results: Mixed results. Child neophobia levels did not significantly change according to CFNS. Food knowledge increased significantly. Parent feedback data on neophobia, knowledge, and food preferences is encouraging.

Conclusions and Implications: Use of *Food Sense Kids* is effective at increasing food knowledge. Parents were positive about the program's effect on child willingness to taste novel foods. Future studies may need to implement larger sample sizes or include multiple taste exposures to individual foods in order to be more successful in decreasing food neophobia.

INTRODUCTION

Food neophobia is a significant barrier to the intake of healthy foods in young children. Food neophobia can be generally defined as the avoidance of or the reluctance to eat foods that are novel or unfamiliar^{1,2} and is particularly associated with preschool age. Food neophobic children like fewer foods, dislike more foods, have tried fewer foods, and prefer a narrower range of foods than their neophilic counterparts.³ Greater levels of neophobia are associated with lower consumption of fruits and vegetables.⁴

It has been shown that the degree of neophobia is directly related to the degree of familiarity with particular foods,⁵ and early exposure to a variety of foods may reduce the degree of neophobia in young children.⁶ Other factors such as behavior modeling and taste exposure have been shown to reduce the neophobic response in young children.⁷ Therefore, it may be hypothesized that an intervention that incorporates behavior modeling which aims to improve young children's familiarity with foods through exposure to a wide variety of foods may be successful in reducing neophobia.

Efforts to reduce food neophobia may be especially important because of the current obesity rates and eating habits of preschool children. Today, approximately one in four preschoolers is either overweight or obese⁸ and recent research tells us children who are overweight as preschoolers are five times more likely to be overweight at age 12.⁹ It has also recently been suggested that the childhood obesity trend may begin as early as age six months.¹⁰ Children over two do not consume the recommended amounts of healthy foods, particularly fruits and vegetables.¹¹ More than 25% of children from age two to three do not consume a distinct portion of vegetables in a day, fewer than 15% consume raw vegetables or vegetables that are dark green or deep yellow,¹² and greater than half of the total fruit intake for all children over two is provided as juice.¹³ One recent study also found that French fries comprised almost 25% of children's consumption of vegetables.⁸

Child-care centers should play an important role in the prevention of unhealthy behaviors due to the fact that today 82% of children younger than six years of age are in care outside of the home¹⁴ and the understanding that children's eating habits are not only shaped at home, but also by the experiences had in a school environment.¹⁵ Nutrition

education interventions implemented in preschool child care centers that are designed to decrease food neophobia may be successful in improving preschool children's eating habits and prevent the development of obesity.

The current study examined whether the *Food \$ense Kids* nutrition education curriculum, implemented as a series of whole food based nutrition education lessons, would reduce food neophobia in three to five year old children participating in preschool child care.

This study was conducted through Supplemental Nutrition Assistance Program-Education (SNAP-Ed) and the Utah Food \$ense program. The goal of SNAP-Ed is to encourage "healthy food choices...consistent with the current Dietary Guidelines for Americans and MyPyramid" and to focus SNAP-Ed efforts on overall dietary quality and behavioral outcomes such as maintaining appropriate calorie balance during each stage of life including childhood and increasing physical activity. The preschool students recruited in this study met the requirements for SNAP-Ed category 3, with at least 50% being low income.¹⁶

METHODS

Design

Lessons from *Food \$ense Kids* (FSK) were implemented in four separate terms in 2011 (Table 1). The children who participated were recruited via parental permission from two preschool care centers, with three terms being conducted at one center, and one term being conducted at a second center. The number of lessons per week and the number of weeks total were decided by the availability of each center at the specific time of the year.

	Term 1	Term 2	Term 3	Term 4
Center	1	1	2	1
Total lessons taught	33	28	22	33
Time of Year	Spring	Summer	Summer	Fall
Lesson frequency	2 per week x 17 weeks	3 per week x 10 weeks	2 per week x 11 weeks	3 per week x 12 weeks

Lessons from FSK in terms 1, 2, and 3 were taught by the graduate student researcher and an additional graduate student who were Registered Dietitians. The discussion and activities in term 4 were taught by two undergraduate dietetics students who were trained and supervised. Snacks were also prepared by the graduate researchers and dietetics students.

The institutional review board at Utah State University approved the project and study materials. Consent was obtained from center directors, and letters of information were sent out to parents about the study with a returnable portion that allowed parents to decline their child's participation.

Food \$ense Kids Curriculum

Food \$ense Kids is an interactive nutrition education curriculum that is designed for preschool children 3 to 5 years of age to increase their familiarity with and knowledge of a wide variety of foods. The curriculum consisted of a total of 33 lessons, with 23 vegetable, 8 fruit, and 2 grain.

Each lesson focused on one food and included a classroom introduction and discussion, one reading/writing (RW) activity, one physical activity (PA), one arts and

crafts activity (AC), two snack recipes, pictures of the food and how it grows, and a handout to be copied and given to parents to take home. The parent handout included the two snack recipes used in the lesson as well as some helpful tips for buying, storing, and preparing the food in order to encourage consumption at home.

Introduction/Discussion

In the introduction, the instructor allows the children to pass around a sample of the food to see, touch, and smell. A basic discussion about the food would follow, including the way the food grows, which parts of the food can be eaten, as well as different ways the food could be prepared and eaten, all of which were illustrated using pictures. The introduction and discussion were designed to last from five to ten minutes.

Activities

Activities were designed to relate to the theme food and teach specific concepts about the food. For example, in the arts/crafts activity in the mushroom lesson, the children made a mushroom using a paper plate and a popsicle stick. The AC activities mainly involved skills such as cutting, gluing and coloring. Physical activities involved motions like jumping, skipping, hopping, and running in place. Examples of RW activities include story time with books related to the theme food, letter and word recognition, practice letter writing and matching games. The majority of the lessons were designed to be conducted indoors and therefore required little space. Each of these activities was designed to last 10 to 15 minutes.

Snacks

The two snack recipes included in the lesson each incorporated the theme food using different ingredients and cooking methods, allowing children to see and sample the foods prepared in different ways. Recipes were included with the goal of allowing children to participate in all or portions of the recipe preparation, which would allow children to be completely aware of the ingredients in the recipe and to be more likely to sample it. Snack time would typically require 30 to 45 minutes to complete.

Curriculum Implementation

The components of each lesson were divided and taught in the am and pm in order to allow children attending only half-day care to receive each lesson. In the am, the class introduction/discussion would be delivered and children would participate in one or two activities. Directly after the activities children would eat the snack, which utilized one of the recipes included in the lesson. In the pm, the class introduction/discussion would be delivered again and children would participate in the remaining one or two activities. Each lesson only included three activities, so if one activity was implemented in the am, the remaining two would be implemented in the pm and vice versa. Activities were alternated between days so that each half-day child was able to participate in each type of activity. Directly after the pm activities, snack would be administered using the second recipe included in the lesson.

At each center, a classroom teacher or graduate instructor would eat with the children in order to model appropriate eating behaviors. Children were also encouraged to taste every snack and only praised for tasting and not for having a specific preference.

Subjects

Children were recruited from pre-kindergarten classes that typically contained children from three to five years of age. A total of 88 children were invited to participate in the study. Twenty four declined to participate and 11 withdrew from the study. In order to compensate for children enrolled in half-day care (morning or afternoon), children were only required to participate in the class discussion, one activity, and one snack per day to be counted as having attended the lesson. Children who failed to attend at least 50% of the lessons offered at their center were excluded from the study. Two children did not attend at least 50% of the lessons and thus were excluded. Overall, 51 children fully participated in the study for a 58% participation rate.

Of the 51 children, 51% were male and 49% female. The majority of children were five-year-olds (51%) with 37% four-year-olds and 10% 3-year-olds. One child was six years old. The majority of the children (84%) were White, 8% were Hispanic and 6% were Asian. The ethnicity of one child was unknown.

Data Collection

To determine the level of neophobia in children, a six-item version of the Child Food Neophobia Scale (CFNS)¹⁷ was administered to parents at baseline and post-intervention. The original CFNS uses ten items to measure children's willingness to try novel foods, and scores are highly correlated with neophobic behavior.⁷ Four questions were excluded because they were inappropriate for the age of the children in this study. The questions were scored on a four point scale from "strongly disagree" to "strongly

agree”. Higher scores were associated with higher levels of neophobia. Chronbach’s alpha for this scale was .942. The six items were:

- My child does not trust new foods.
- If my child doesn’t know what’s in a food he or she won’t try it.
- My child is afraid to eat things he or she has never had before.
- My child will eat almost anything. (reverse scored)
- My child is very particular about the foods he or she will eat.
- My child is constantly sampling new and different foods. (reverse scored)

A similar six-item version of the CFNS designed to assess food neophobia in parents was administered at baseline and post-intervention. The six questions from the child version were converted to address parents (i.e. “My child does not trust new foods” to “I do not trust new foods”). This scale was scored identically to the child version. Chronbach’s alpha for this scale was .942. The child and parent CFNS were each sent home at baseline and post-intervention, completed by parents, and returned to the graduate researcher.

Child Food Knowledge and Preferences

Child food knowledge and food preferences were measured at baseline and post-intervention using a Food Preference Survey adapted from the Washington Department of Health SNAP-Ed Guide to Program Evaluation. The adapted Food Preference Survey was reviewed for validity by ten Registered Dietitians.

The survey listed the study foods and respondents were required to mark one of four possible options that best described the child’s preference/knowledge of each food. The four options were “do not like this,” “like this a little,” “like this a lot,” and “don’t know what this is.” Child knowledge was scored by assigning a zero to “don’t know what

this is” and assigning a one to the other three options to indicate the child had enough knowledge or familiarity with the food to determine a distinct preference for it. Higher scores indicated higher overall knowledge of the study foods. Food preferences were scored on a three point scale, with “do not like this” assigned a one, “like this a little” assigned a two, and “like this a lot” assigned a three. Higher scores indicated higher overall liking for the study foods. See Appendix A for the full survey.

The survey was administered in the classroom one-on-one with each child by the graduate researcher, using photographs to give children a visual representation of the foods they were asked about. Children were prompted with the food name if they were unable to identify it from the picture. The child survey also included cartoon faces that expressed each of the four options in order to help children accurately communicate their preferences and knowledge. The survey was also sent home, completed and returned by parents about their child so parent and child responses could be compared. Due to the young ages of the children, the parent surveys acted as a second report in order to increase validity of the measures with young children. See Appendix B for the full survey.

Parent Feedback

A 10-question, post-intervention survey was completed by parents regarding the study’s impact on their children and themselves. This survey assessed how parents believed FSK affected neophobia, preferences, and/or knowledge and if FSK had influenced foods prepared and eaten in the home. Questions one through five on the survey related to changes in child behaviors, and questions six through ten related to parent behaviors. Parents were also asked to offer experiences related to their child’s

participation and suggestions for the future. Each of the questions was ranked from strongly agree to strongly disagree, including a neutral category, and percentage of parents in each category was determined. See Appendix F for full parent feedback survey.

Statistical Analysis

Of the 33 foods in the curriculum, two were excluded from analysis (whole wheat and dried fruit) because they did not adequately represent individual foods, leading to inconsistent responses from parents and children. Of the 51 parents who completed data for the study, six of the data packets were not completed by the same parent at baseline and post-intervention and four data packets had missing data. Therefore, data from 41 parents (80%) were able to be included in the parent statistical analysis. The post-intervention feedback survey was received by 51 (100%) parents. Of the 51 children who participated in the study, seven knowledge surveys were not able to be obtained by the graduate researcher, so 44 children (86%) were able to be included in the child statistical analysis of neophobia and food knowledge, however, only 42 children were included in the food preference analysis because two children reported no knowledge of any of the study foods and thus reported no preferences.

RESULTS

Food Neophobia Scale

Results from the child CFNS indicate that the mean neophobia score for children at baseline was 2.59 (SD 0.75), indicating moderate neophobia. The mean score post-intervention was 2.46 (SD 0.74). Although this indicated a slight decrease in neophobia,

the mixed models analysis revealed that this difference was not statistically significant ($p = 0.12$, $F = [1,39] 2.41$, $n = 41$) using a p -value significance of <0.05 . Results from the parent CFNS indicate parent's mean neophobia scores from baseline to post-intervention were also not statistically significant ($p = 0.17$, $F = [1,39] 1.87$, $n = 41$), with a baseline mean of 2.07 (SD 0.62) and 2.00 (SD 0.61) at post-intervention.

Child Food Knowledge

A mixed models analysis was conducted to determine whether changes in food knowledge occurred as a result of the nutrition education. Results from the data collected directly from children indicate that of the 31 total foods, overall knowledge increased from an LS mean of 14.84 foods at baseline to 20.39 foods at post-intervention. This increase was statistically significant ($p = <.0001$, $t = -8.78$, $df = 43$, $SE = .63$, $n = 44$). Table 2 shows the results by individual foods. Child responses for individual foods were excluded from analysis if they did not attend the lesson. Knowledge increased significantly for 18 of the 31 foods, 13 of which were vegetables. Three foods (corn, green beans, strawberries) were known by all children at baseline and post-intervention.

Food	Mean Pre % Know	Mean Post % Know	% Difference	DF	t	P-value
Alfalfa Sprouts	29.6	81.5	51.9	52	-4.41	<.0001*
Artichokes	23.3	69.8	46.5	42	-4.84	<.0001*
Asparagus	71.1	86.8	15.7	37	-1.78	.0831
Avocado	71.8	89.7	17.9	38	-2.21	.0329*
Bell Pepper	67.5	95	27.5	78	-3.32	.0014*
Black Beans	60	90	30	39	-3.67	.0007*
Carrots	100	96	-4	26	1.00	.3265
Coconut	63	85.2	22.2	26	-2.28	.0310*

Corn	100	100	0	-	-	-
Couscous	55.6	77.8	22.2	8	-1.51	.169
Edamame	54.3	77.1	22.8	34	-2.26	.0303*
Eggplant	36.8	71	34.2	37	-3.15	.0032*
Garbanzo Beans	24.3	70.3	46	36	-4.62	<.0001*
Grapefruit	57.5	85	27.5	39	-2.91	.0060*
Green Beans	100	100	0	-	-	-
Jicama	3.1	62.5	59.4	31	-6.73	<.0001*
Kiwi	61.1	94.4	33.3	35	-4.18	.0002*
Lettuce	85.4	90.2	4.8	40	-0.70	.4863
Mango	51.4	94.6	43.2	72	-4.73	<.0001*
Mushrooms	82.8	89.7	6.9	28	-0.81	.4238
Onions	70	95	25	39	-3.20	.0027*
Pears	96.3	96.3	0	52	0.00	1.0
Pineapple	88.9	100	11.1	35	-2.09	.0438*
Potatoes	92.9	96.4	3.5	27	-1.00	.3262
Rutabaga	43.9	60.9	17	40	-1.86	.0701
Spinach	61.5	84.6	23.1	25	-2.00	.0560
Squash	42.5	80	37.5	39	-4.05	.0002*
Strawberries	100	100	0	-	-	-
Sweet Potato	40.5	81	40.5	72	-3.87	.0002*
Tomato	88.6	100	11.4	34	-2.09	.0437*
Zucchini	74.1	92.6	18.5	52	-1.85	.0701

The knowledge data collected from parents about their children demonstrated slightly different results. Results indicate that overall knowledge increased from an LS mean of 18.12 foods at baseline to 20.75 foods at post-intervention. This increase was statistically significant ($p = <.0001$, $t = -5.05$, $df = 40$, $SE = .52$, $n = 41$). Table 3 shows the results by individual foods. Parent responses for individual foods were excluded from analysis if their child did not attend the lesson. Knowledge increased significantly for 12 of the 31 foods, ten of which were vegetables. Also, 10 of the 31 foods were reported to be known by all children at baseline and post-intervention.

Food	Mean Pre % Know	Mean Post % Know	% Difference	DF	t	P-value
Alfalfa Sprouts	47.6	85.7	38.1	40	-2.79	.0080*
Artichokes	64.7	88.2	23.5	33	-2.77	.0092*
Asparagus	72.7	90.9	18.2	32	-2.25	.0316*
Avocado	83.8	94.6	10.8	36	-2.09	.0438*
Bell Pepper	84.2	94.7	10.5	37	-1.67	.1031
Black Beans	100	100	0	-	-	-
Carrots	100	100	0	-	-	-
Coconut	75	90	15	19	-1.37	.1864
Corn	95.7	100	4.3	22	-1.00	.3282
Couscous	42.1	68.4	26.3	18	-2.54	.0207*
Edamame	39.1	82.6	43.5	22	-3.54	.0019*
Eggplant	58.3	86.1	27.8	70	-2.73	.0080*
Garbanzo Beans	66.7	91.7	25	35	-3.00	.0049*
Grapefruit	78.4	83.8	5.4	36	-0.70	.4870
Green Beans	100	100	0	-	-	-
Jicama	16.1	64.5	48.4	60	-4.39	<.0001*
Kiwi	91.4	91.4	0	68	-0.00	1.00
Lettuce	100	100	0	-	-	-
Mango	79.2	100	20.8	23	-2.46	.0218*
Mushrooms	100	100	0	-	-	-
Onions	94.9	100	5.1	38	-1.43	.1600
Pears	100	100	0	-	-	-
Pineapple	100	100	0	-	-	-
Potatoes	100	100	0	-	-	-
Rutabaga	42.3	69.2	26.9	25	-2.57	.0164*
Spinach	100	100	0	-	-	-
Squash	88.2	97.1	8.9	66	-1.39	.1682
Strawberries	95.7	100	4.3	22	-1.00	.3282
Sweet Potato	89.7	100	10.3	38	-2.08	.0439*
Tomato	100	100	0	-	-	-
Zucchini	92.3	96.2	3.9	50	-0.59	.5610

Child Food Preference Results

Results from the child data indicate a mean score of 2.23 ($n = 42$, $SD = .40$) at baseline and 2.13 ($SD = .43$) at post-intervention. This difference was not statistically

significant ($p = 0.135$, $F = 2.326$, $MS = .177$, $df = 1$). Results from parents indicate a mean score of 2.18 at baseline ($n = 41$, $SD = .43$) and 2.16 at post-intervention ($SD = .43$). This difference was also not statistically significant ($p = .376$, $F = .801$, $MS = .052$, $df = 1$).

Parent Feedback Survey Results

On the questions related to child behaviors, the majority of parents ($n = 51$) agreed or strongly agreed that their children's behaviors had been positively affected through participation in FSK. Approximately 56% of parents agreed or strongly agreed their child was more willing to taste novel foods, 58% of parents agreed or strongly agreed they had seen changes in their child's food preferences, and 50% agreed or strongly agreed their child was more willing to eat vegetables. One parent commented, "My daughter has been more willing to try new foods at home as a result of trying them at school." The great majority of parents also agreed or strongly agreed that their child's food knowledge had increased (94%) and their child had expressed a desire to eat the study foods (74%). Another parent commented, "The nutrition info and snack variety has tremendously enhanced my daughters learning and attitude towards new food."

Although changes in parent behaviors were not an aim of this study, on the questions related to them, parents indicated the intervention that had taken place with their children had mixed effects on their own behavior. Approximately 58% agreed or strongly agreed they were more familiar with a wider variety of foods and 47% agreed or strongly agreed they were more willing to taste unfamiliar foods, while 15% of parents disagreed or strongly disagreed with those questions. Question 8, which asked whether the study had affected the foods purchased and/or eaten in their home, was agreed to by

47%, but was also disagreed to by 19% of parents. However, one parent commented that “My son made me buy garbanzo beans and cook them the next day” and another parent noted that her daughter “asked to make several items that were made at school and talks a lot about what she’s learned about different foods.” Over 92% of parents agreed or strongly agreed they had discussed the study foods with their child, and 70% agreed or strongly agreed the take home messages were useful to their family. Another parent commented “I think the program is great! The recipes are very useful!” Table 4 displays these results.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. My child is more willing to try new, unfamiliar foods.	0	7.84	35.29	31.37	25.49
2. I have seen changes in my child’s food preferences.	0	8	34	42	16
3. My child is more willing to eat vegetables.	0	10	40	40	10
4. My child’s knowledge about different foods has increased.	0	1.96	3.92	47.05	47.05
5. My child has expressed a desire to eat the foods they have been introduced to in the study.	0	13.73	11.76	52.94	21.57
6. I am more familiar with a wider variety of foods as a result of my child’s participation.	1.96	13.73	25.49	45.10	13.73
7. I am more willing to try new, unfamiliar foods as a result of my child’s participation.	3.92	11.76	37.25	39.22	7.84
8. My child’s participation has affected the foods purchased and/or eaten in our home.	1.96	17.65	33.33	37.25	9.80
9. My child and I have discussed the foods they learned about during the study.	0	0	7.84	60.80	31.37

10. The take home messages that include recipes are useful to me.	1.96	3.92	23.53	47.05	23.53
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DISCUSSION

The current study yielded mixed results in regards to food neophobia, knowledge, and preferences.

Participation in *Food \$ense Kids* did not produce a statistically significant reduction in overall food neophobia according to the Child Food Neophobia Scale. This lack of significance suggests that the current implementation of FSK was inadequate to significantly reduce neophobia, which may be due to small sample size or the lack of multiple taste exposures to each food. Future studies may need to place greater emphasis on multiple taste exposures⁷ in order to be more successful in decreasing the overall neophobic response in preschool children. However, the p value (0.12) did approach statistical significance at the $p < 0.10$ value, and the majority of parents agreed that their child was more willing to try new, unfamiliar foods. These results may suggest that studies which incorporate larger sample sizes may be more successful in decreasing neophobia in children through the use of *Food \$ense Kids*. This may warrant future studies that explore whether continual exposure to unfamiliar foods over an extended time period, even without multiple exposures to individual foods, could successfully reduce preschool food neophobia.

Results also indicated that participation in FSK did not significantly alter child's food preferences. The data showed that on average the study foods were liked a little, and that average did not significantly change from baseline to post-intervention. However, significant changes in food preferences were not generally expected in this study due to

established literature that explains at least 10 to 15 exposures are necessary before genuine preferences are formed.¹⁸ However, some encouraging data was gathered from parent feedback surveys indicating that FSK was successful in improving children's desire to be further exposed to the study foods. The majority of parents agreed they had seen positive changes in their child's food preferences as a result of participation in FSK and nearly three quarters of parents agreed their child had expressed a desire to eat the foods they had been introduced to in the study. These results are encouraging because it may suggest that exposures to novel foods in a child care environment can lead to further exposure to the novel foods in the home. It may also suggest that repeated exposures to the study foods would likely be positively accepted, which may serve in time to impact food preferences.

FSK was successful in increasing the food knowledge of preschool children. Participation in FSK significantly increased child knowledge of study foods from baseline to post-intervention according to the Food Preference Survey collected directly from children as well as from their parents. Also, over 90% of parents indicated on the post-intervention survey that they believed their child's knowledge of different foods had increased as a result of participation in FSK. It is worthy to note that at baseline, parents reported that their children knew a greater number of the study foods than the number of foods their children were able to report knowledge of. An explanation may be that parents overestimate their child's actual food knowledge or it may be that children state that they did not know what a food is as a result of being unsure of their food preferences. Future studies that collect food knowledge data from children should include an option to

denote whether a child can identify a food by name from a picture and an option for children who can identify the food name but cannot identify a specific preference.

Reported parent behaviors were largely unaffected by child participation in FSK. Although no changes in parent behaviors were expected as a result of this study, data was collected about parents to determine if the combination of FSK in their child's classroom and the take home recipes had any effect on their own study related behaviors. No overall changes in reported parent neophobia occurred according to the CFNS and less than half of parents agreed on the post-intervention survey that they were more willing to try new, unfamiliar foods, which suggests that parent neophobia is largely unaffected by a neophobia based intervention taught to their children in a child care environment. The majority of parents agreed that they were more familiar with a wider variety of foods as a result of the study, that the take home recipes were useful and that they had discussed the foods with their child at home, which suggested that information taught in the classroom can translate to the home. However, slightly less than half of parents agreed that the study had affected the foods purchased and/or eaten in their home, which suggests that in general, family eating behaviors were not significantly influenced by the intervention.

CONCLUSIONS

Findings from the current study suggest that *Food Sense Kids* was successful at increasing child food knowledge, indicating that child care centers can be important in teaching children about food and nutrition. FSK did not significantly reduce food neophobia; however results suggest that future studies which incorporate larger sample sizes or multiple exposures to individual novel foods may be successful in decreasing

preschool food neophobia. Overall, children desired to be continually exposed to the FSK foods and parents were positive about the effects of the program on their children, suggesting that an interactive nutrition curriculum such as FSK can positively impact healthy eating behaviors in preschool children. Future studies may benefit from exploring additional ways to incorporate parental involvement to encourage healthy eating habits in the home as well as the child care environment.

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CHAPTER 3

EVALUATION OF FOOD \$ENSE KIDS CURRICULUM: BEST PRACTICES FOR
IMPLEMENTING NUTRITION EDUCATION IN A PRESCHOOL SETTING

Abstract: *Food \$ense Kids* (FSK) is a nutrition education curriculum for preschool children ages three to five, designed to introduce children to a variety of foods in order to reduce food neophobia and encourage development of healthy eating habits. It was implemented at two preschool facilities and evaluated for child engagement, effectiveness across settings, and ease of implementation. Results indicate FSK was engaging and easy to implement, and had consistent results across settings in measures of child food neophobia, knowledge, and preferences. The curriculum evaluation also offered a greater understanding of best practices to apply when implementing nutrition education to preschoolers.

Introduction

Extension educators and child care providers have the opportunity to greatly influence the eating habits and food preferences of preschool children and can help them establish healthy habits that continue into adolescence and adulthood (ADA, 2011). School based nutrition interventions are especially needed because an estimated 82% of children younger than six years of age are in care outside of the home (Briley & McAllaster, 2011). Extension educators who have nutrition knowledge can be invaluable in this process, especially because many child care providers lack knowledge and training in nutrition (Dunn et al., 2006).

Extension educators can also help child care providers implement certain best practices when applying a nutrition education curriculum in order to improve learning, engage children, and increase willingness to taste novel foods. The application of best practices when implementing a nutrition curriculum to a preschool audience is extremely important, because negative experiences with food can lead to dislike and actually act as a barrier to adopting a wide variety of foods into their diet (Tuorila & Mustonen, 2010).

Nutrition education interventions that increase children's exposure to a variety of healthy foods that young children consume are especially needed because nutrition standards can vary considerably between child care facilities (Van Horn, 2011). Many child care homes offer little fruits and vegetables, often serve sweet snacks, and include meals and snacks that exceed the recommended limit for saturated fat (Larson et al., 2011).

This study was conducted through Supplemental Nutrition Assistance Program-Education (SNAP-Ed) and the Utah Food \$ense program. The goal of SNAP-Ed is to encourage "healthy food choices...consistent with the current Dietary Guidelines for Americans and MyPyramid." Each state is encouraged by the USDA Food and Nutrition Service to focus SNAP-Ed efforts on overall dietary quality and behavioral outcomes such as maintaining appropriate calorie balance throughout each stage of life including childhood. Each facility in this study met the SNAP-Ed category 3 requirements of low income students (Burr, 2012).

The purpose of this study was to evaluate the efficacy of *Food \$ense Kids* in yielding equally effective results in measures of food neophobia, food knowledge, and food preferences across child care facilities with different nutrition related policies, as

well as efficacy in engaging children in nutrition related activities and gaining teacher support and recommendation. The evaluation of *Food Sense Kids* allowed researchers to elucidate best practices to apply when implementing a nutrition curriculum to preschool children.

Methods

Design

Food Sense Kids (FSK) was evaluated at two child care facilities in 2011. The curriculum was implemented in the spring, summer, and fall at facility 1, and was implemented once in the summer at facility 2. The number of lessons taught from the curriculum varied at each facility depending on the number of weeks each facility had available to implement the study. The children in facility 1 received an average of 31 lessons and the children in facility 2 received 22 lessons. Lessons given at facility 1 were taught by two graduate student researchers who were Registered Dietitians and two trained dietetics students. Lessons given at facility 2 were taught by the graduate student researchers.

The institutional review board at Utah State University approved the project and study materials. Consent was obtained from each facility director and letters of information were sent out to parents about the study that could be signed and returned to decline their child's participation.

Curriculum

Food Sense Kids (FSK) is an interactive nutrition education curriculum designed to introduce preschool children to a wide variety of vegetables, fruits and grains in an

attempt to decrease neophobia, the fear of new foods, and to increase food knowledge.

The curriculum consisted of 33 lessons, including 23 vegetable, 8 fruit, and 2 grain. Each lesson centered on one food and included a classroom discussion, three activities (reading/writing, physical, and arts/crafts), two snack recipes (one am and one pm), a background information sheet about the foods for teachers, and a recipe handout to be copied and given to parents to take home. The teacher background information sheet provided material on how the food is grown, how it can be bought, prepared, and stored as well as other pertinent facts about the food that they could use to teach the children.

Children are allowed to explore the food itself as often as possible during the lesson. During the classroom discussion children would pass around a sample of the food and were encouraged to touch and smell it. Whenever possible, children were given the opportunity to assist with food preparation (i.e. mixing, dumping, kneading, etc.) at snack time.

All of the activities were designed to relate to the theme food and teach the food concept. The arts/crafts activities (AC) mainly involved skills such as cutting, gluing and coloring. Physical activities (PA) typically involved motions like jumping, skipping, hopping, and running in place. Examples of reading/writing (RW) activities include story time with books related to the theme food, letter and word recognition, practice letter writing and matching games. The majority of the lessons were designed to be conducted indoors and therefore required little space. Each of these activities was designed to last 10 to 15 minutes. In order to allow children who strictly attended half-day care to participate in every type of activity, the activities were alternated between am and pm schedules. For example, if a lesson incorporated one activity in the morning and two in the afternoon,

then the next lesson taught would incorporate two in the morning and one in the afternoon.

The effectiveness of a curriculum is essential to its success. An effective curriculum should contain specific qualities in content, readability and utility (Coleman et al., 2011). FSK incorporated many of these qualities. Lessons were written by Registered Dietitians and Extension professionals who ensured its accuracy. It was reviewed by experts in nutrition and early childhood education that ensured it was appropriate for the target audience. It also incorporated specific and measurable objectives, and provided all the information necessary to completely implement the curriculum (Coleman et al., 2011).

Child Care Centers

At facility 1, classrooms typically consisted of one lead teacher and two assistant teachers. Snacks were served to children divided between three small tables, with each table holding from four to seven students. One to two classroom teachers sat at each table and ate with the children as per the facility's policy. The snacks were served family style, and children served themselves. This format allowed snack time to remain consistent for the children from day to day.

At facility 2, classrooms typically consisted of one lead teacher and one assistant teacher. Snacks were served with children divided between three small tables, with each table holding up to eight students. At this facility classroom teachers did not sit at the tables or eat with the students, and snacks were pre-plated and served directly to the students by the research instructors, which was consistent with the facility's regular

routine. However, the research instructors went to each table and modeled eating a few bites while encouraging children to taste the snack.

Facility 1 participated in the United States Department of Agriculture's Child and Adult Care Food Program and provided meals and snacks to the children. Facility 2 did not participate in any child nutrition program.

Subjects

The children invited to participate in the study attended the 3 to 5-year-old class at each facility. Sixty-four children were invited to participate from facility 1 between the three separate implementation periods. Seventeen declined to participate and five withdrew from the study. In order to be counted as present for a lesson, children needed to attend the class discussion, one activity, and one snack per lesson. Those who did not attend at least 50% of the lessons were excluded from the study. Two did not attend 50% of the lessons, leaving a total of 40 students who participated from facility 1 for a 62% participation rate. Teacher feedback was received from five teachers who were directly involved with the study from facility 1.

Twenty four children from facility 2 were invited to participate. Seven declined participation, five withdrew from the study, and one did not attend 50% of the lessons, leaving a total of 11 students who participated from facility 2 for a 46% participation rate. Three teachers were asked to complete study feedback. Responses were received from all three.

Facility 1 children were 53% male, 80% were White, 10% were Asian and 6% were Hispanic. The ethnicity of one child (4%) was marked N/A. Facility 2 children were 64% female, 91% were White and 9% were Hispanic.

Measures and Data Collection

Engagement

In order to determine if *Food Sense Kids* would be successful at engaging children, overall classroom engagement was measured using the Engagement Check II (McWilliam, 1999), which is designed to measure the percentage of children engaged at 15 second intervals throughout a specific activity. This data allowed researchers to gauge the efficacy of the nutrition related activities in FSK at engaging preschool children. The engagement assessments were completed by trained dietetics students who observed activities from an observation room where children were unaware of their presence. These assessments were conducted during the spring term at facility 1 with a class that contained approximately 29 students. These observations were gathered for the duration of the study period, once a week for the initial three weeks and then twice a month for the remaining three months.

Neophobia

At each facility child neophobia was measured at baseline and at post-intervention using a six-item version of the Child Food Neophobia Scale (CFNS) (Pliner, 1994), which is designed to measure child's willingness to taste novel foods. Food neophobia in parents was also measured at each facility at baseline and post-intervention using the same six-item CFNS with questions altered to be directed toward parents. All of the six-

items on each CFNS were scored on a 4-point scale from strongly agree to strongly disagree. Higher scores were associated with more neophobic behaviors. The cronbach's alpha for each measure in this sample was .942. See Appendix D for the child CFNS and Appendix E for the parent CFNS. Results from each facility were then compared to determine if any differences in neophobia existed between facilities prior to and after the curriculum intervention.

At facility 1, the child and parent CFNS surveys were placed in parent boxes that were traditionally used for announcements and other messages from the teachers to be transferred to parents. Each survey included instructions for the parents to fill out the surveys and how to return them to the graduate researcher. At facility 2, parent messages were traditionally delivered through email, so the child and parent CFNS surveys were emailed to parents with instructions on how to fill out the surveys. Parents were instructed to fill out the surveys and return hard copies to the graduate researcher at the facility.

Child Food Knowledge and Food Preferences

Child food knowledge and preferences were collected at baseline and post-intervention using an adapted version of a Food Preference Survey from the Washington Department of Health SNAP-Ed Guide to Program Evaluation. The adapted Food Preference Survey was reviewed and validated by ten Registered Dietitians. The survey listed the study foods and respondents were instructed to choose between four possible answers to indicate the child's preference/knowledge for each food. The four options were "do not like this," "like this a little," "like this a lot," and "don't know what this is."

Child food knowledge was scored by assigning a zero to the option “don’t know what this is” and assigning a one to any of the other three options, which indicated the child was familiar enough with the food to have a distinct preference. Higher scores indicated higher overall food knowledge. Food preferences were scored on a three point scale, with “do not like this” assigned a one, “like this a little” assigned a two, and “like this a lot” assigned a three. Higher scores indicated higher overall preference for the study foods. Knowledge and preference results from each facility were compared. See Appendices A and B for full surveys.

The survey was also administered in the classroom one-on-one with each child by the graduate researcher, using photographs to show children the foods they were asked about. The child survey also included cartoon faces that expressed each of the four options in order to help children accurately communicate their preferences and knowledge. At each facility the graduate researcher would find a quiet environment in or just outside of the classroom to complete the survey with each child in order to avoid distractions or influences from other students.

The survey was also completed by parents about their child. At facility 1, the surveys to be filled out by parents were placed in parent boxes along with the CFNS and at facility 2 the survey was emailed to parents also along with the CFNS. Due to the young ages of the children, the parent surveys acted as a second report in order to increase validity of the measures with young children.

Teacher feedback

A feedback survey was given to teachers directly involved in the study at post-intervention. At each facility each survey was hand delivered to each teacher, completed,

and returned to the graduate researcher. The survey contained questions about neophobia, food knowledge and preferences in their students, curriculum effectiveness, and ease of implementation across a variety of child care programs. Questions were measured using a scale ranging from strongly agree to strongly disagree including a neutral option, and the percentage of teachers who marked each category was determined. An additional section was provided for teachers to share experiences in the classroom related to the nutrition study as well as suggestions for future implementation. See Appendix C for full teacher feedback survey.

Statistical Analysis

Of the 40 parents who completed data for the study from facility 1, six of the packets were not filled out by the same parent at baseline and post-intervention and four packets had missing data, leaving 30 parent data packets (75%) to include in parent statistical analysis. Also, of the 40 children data was collected from, five surveys were not able to be obtained, leaving 35 (87.5%) to be included in child statistical analysis.

All 11 parent data packets from facility 2 were able to be included in parent statistical analysis. Of the 11 facility 2 children, two surveys were not able to be collected, leaving nine (81.8%) to be included in child statistical analysis. However, only seven children were able to be included in the analysis of food preferences, because two children reported they were not familiar with any of the study foods and therefore did not have any preferences for them.

Results

Engagement Results

All three types of activities provided in the *Food \$ense Kids* nutrition education curriculum were successful in engaging preschool children. Reading/writing (RW) activities had a mean engagement of 90.2 %. Physical activities (PA) had a mean engagement of 91.3%. Arts/crafts activities (AC) had the highest mean engagement of 95.8%. Two sample t-tests were conducted between the three activity types. No significant difference was found between PA and RW ($p = 0.501$, $df = 209$). Significant differences were found between AC and RW ($p = <.000$, $df = 272$) and between AC and PA ($p = 0.003$, $df = 206$). A single factor ANOVA reinforced the t-test results with AC being significantly different from RW and PA ($p = <0.000$, $F = 9.18$, $df = 2$, $MS = .133$).

Curriculum Results by Facility

Food Neophobia

A mixed models analysis was conducted to determine if differences in child neophobia existed between facility 1 and 2. The mean baseline and post-intervention scores for facility 1 were 2.54 and 2.41, respectively. The mean baseline and post-intervention scores for facility 2 were 2.74 and 2.61, respectively. With a score of 4 indicating the highest level of neophobia, these scores indicate moderate neophobia present at both facilities. The differences between facilities were not statistically significant ($p = 0.33$, $F = 0.94$). A mixed models analysis was also conducted to determine if differences in parent neophobia existed between facility 1 and 2. The mean baseline and post-intervention scores for facility 1 were 2.04 and 1.97 respectively. The mean

baseline and post-intervention scores for facility 2 were 2.18 and 2.11 respectively. The differences between facilities were not statistically significant ($p = 0.52$, $F = 0.42$).

Child Food Knowledge

Repeated measures ANOVA were conducted to determine if food knowledge differences existed between the children from the two facilities. The knowledge data collected one-on-one from the child with the graduate researcher indicates that at baseline children attending facility 1 had a mean knowledge of 67.5% ($n = 35$, $SD = .14$) of the study foods and at post-intervention had a mean knowledge of 89% ($SD = .11$). Children at facility 2 had baseline knowledge of 32.9% ($n = 9$, $SD = .22$), and at post-intervention had a mean knowledge of 71% ($SD = .18$). The test of between-subjects effects was significant ($p = .000$, $F = 37.61$, $df = 1$, $MS = .988$), indicating a significant difference in knowledge scores between facilities independent of time. The within-subjects effects test of knowledge was significant ($p = .026$, $F = 5.35$, $df = 1$, $MS = .099$), and knowledge by facility interaction test was significant ($p = .000$, $F = 68.63$, $df = 1$, $MS = .988$), indicating that knowledge scores at each facility increased at statistically significant rates over time independent from each other. Figure 1 displays these results.

The knowledge data collected from parents about their children indicates that at baseline children attending facility 1 had a mean knowledge of 84.5% ($n = 30$, $SD = .11$) of the study foods and at post-intervention had a score of 93% ($SD = .10$). Children attending facility 2 had a baseline knowledge of 64.3% ($n = 11$, $SD = .22$) of the study foods, and at post-intervention had a knowledge score of 91% ($SD = .17$). The test of between-subjects effects was significant ($p = .014$, $F = 6.59$, $df = 1$, $MS = .191$), indicating a significant difference in knowledge scores between facilities independent of

time, reinforcing the data collected directly from the children. The within-subjects effects test of knowledge was significant ($p = .000$, $F = 46.69$, $df = 1$, $MS = .525$), and knowledge by facility interaction test was significant ($p = .001$, $F = 12.33$, $df = 1$, $MS = .139$), indicating that knowledge scores at each facility increased at significant rates over time independent from each other, also reinforcing the data collected directly from the children. Figure 2 displays these results.

FIGURE 1

Child percent knowledge by facility from baseline to post-intervention (Child responses)

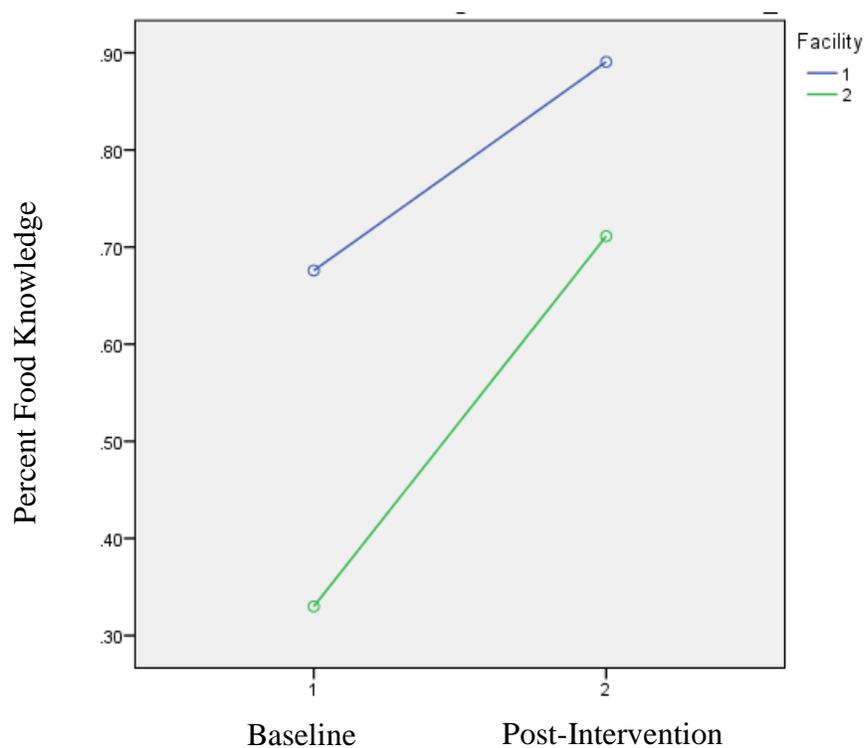
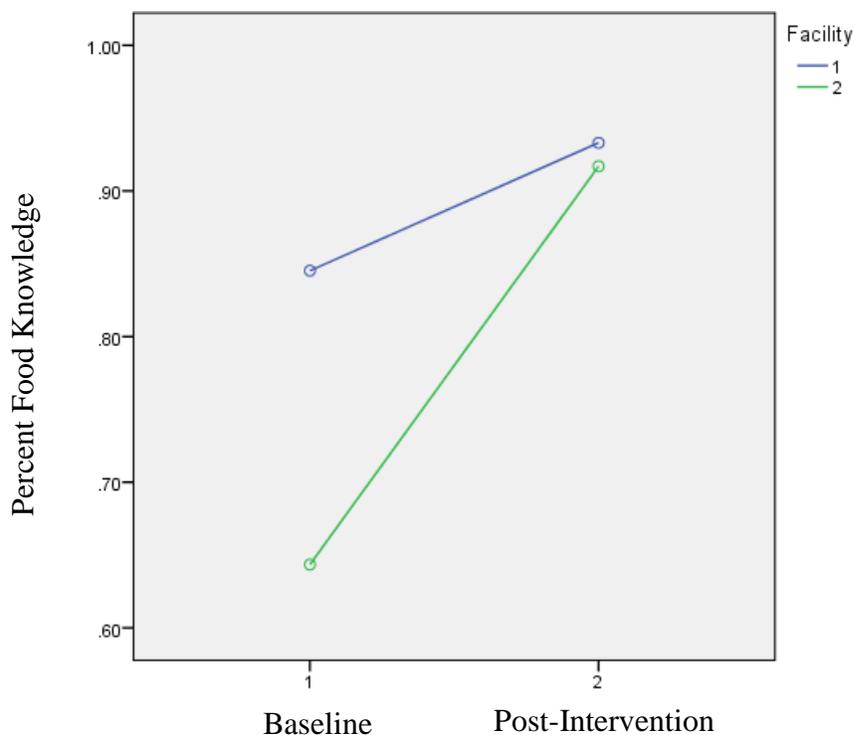


FIGURE 2

Child percent knowledge by facility from baseline to post-intervention (Parent responses)



Food Preferences

Repeated measures ANOVA were conducted to determine if differences in food preferences existed between facilities. The data collected directly from the children indicates that mean baseline scores were 2.26 ($n = 35$, $SD = .41$) and 2.09 ($n = 7$, $SD = .33$) for facilities 1 and 2, respectively. Mean scores at post-intervention were 2.17 ($SD = .42$) and 1.92 ($SD = .42$), respectively. The within-subjects effects test for preference by facility was not significant ($p = .642$, $F = .219$, $df = 1$, $MS = .017$), indicating that overall preferences at each facility for the study foods were not significantly different from each other over time. Between-subjects results were also not significant ($p = .179$, $F = 1.868$,

df = 1, MS = .506), indicating that no differences in preferences between facilities existed independent of time. Table 5 displays these results.

TABLE 5
Food Preference Scores and ANOVA for Facilities (Child responses)

	Facility 1 Baseline	Facility 2 Baseline	Facility 1 Post	Facility 2 Post
Mean Preference Score	2.26	2.09	2.17	1.92
SD	.41	.33	.42	.42
ANOVA				
	DF	MS	F	p
Between Subjects	1	.506	1.868	.179
Within Subjects	1	.017	.219	.642

Results from the data collected from parents about their child's food preferences correspond with the child data. Mean baseline scores for facilities 1 and 2 were 2.21 (n = 30, SD = .36) and 2.10 (n = 11, SD = .58) respectively. The mean preference scores at post-intervention were 2.23 (SD = .40) and 1.96 (SD = .46) respectively. The within-subjects effects test for preference by facility was not significant (p = .197, F = 1.72, df = 1, MS = .111), and neither were the between-subjects changes (p = .173, F = 1.92, df = 1, MS = .582), drawing the same conclusions as the child data that no differences in preferences existed between facilities over time or independent of time. Table 6 displays these results.

TABLE 6
Food Preference Scores and ANOVA for Facilities (Parent responses)

	Facility 1 Baseline	Facility 2 Baseline	Facility 1 Post	Facility 2 Post
Mean Preference Score	2.21	2.10	2.23	1.96
SD	.30	.58	.40	.46
ANOVA				
	DF	MS	F	p
Between Subjects	1	.582	1.92	.173
Within Subjects	1	.111	1.72	.197

Teacher Feedback

A total of eight teachers completed and returned a feedback survey, five of which were lead teachers and three were teacher assistants. Fourteen questions were asked regarding outcomes of the nutrition study. All eight (100%) of the teachers agreed or strongly agreed with the following statements:

- Nutrition education that introduces children to new, unfamiliar foods is necessary in the preschool setting.
- The nutrition related activities presented in this study were developmentally appropriate for the 3-5 year age group.
- The nutrition related activities presented in this study were effective at engaging the children.
- The nutrition related activities could be easily implemented into a variety of preschool programs.
- Maintaining a positive environment at snack time impacts child food acceptance.
- My willingness to try new foods as a teacher affects the willingness of the child to try new foods.
- I am more familiar with a wider variety of foods as a result of my participation in the nutrition study.
- My knowledge about different foods has increased as a result of my participation in the nutrition study.
- The majority of the children in my class are more familiar with a wider variety of foods as a result of their participation in the nutrition study.

- The children's knowledge about different foods has increased as a result of their participation in the nutrition study.
- The children in my class discuss the foods they learned about in the nutrition study.

Seven out of the eight teachers (87.5%) agreed or strongly agreed and one teacher

(12.5%) disagreed with the following statement:

- The recipes/snacks used in this study could be easily implemented into a variety of preschool programs.

Seven out of the eight teachers (87.5%) agreed or strongly agreed and one teacher

(12.5%) was neutral about the following statements:

- I am more willing to try new, unfamiliar foods as a result of my participation in the nutrition study.
- The majority of the children in my class are more willing to try new, unfamiliar foods as a result of their participation in the nutrition study.

Teacher comments from the feedback survey were organized by main themes.

Some of the comments are included below. These comments allowed the researchers to identify areas to focus on when implementing nutrition curriculum in a preschool child care facility.

Activities:

“The activities were great! There was such a great variety of activities that were hands on and engaging for the children.”

“Everything that was done was great. I don't really think I need to give any suggestions because they literally were perfect.”

Trying/Learning about new foods:

“I thought the kids did a great job trying foods. Some of the children who didn't try it were influenced by their other peers who would complain without even trying it.”

“We went on a field trip to the grocery store as a class. While the guide was taking us through the produce department one of the kids said, ‘Hey, there’s asparagus.’ The guide asked them if they recognized any other produce and they pointed to kiwi, onions, and pineapple.”

“One child just walked up to me with an eggplant toy and told me, ‘Look teacher! An eggplant.’ The kids seem to have enjoyed learning about new foods, if not always enjoying having to eat it.”

“It was good to see the change from initial uncertainty to excitement as the children got used to [study] days. I also really appreciated that my input as a teacher was valued. We had good communication between us.”

“Just yesterday I met the aunt of one of our students. She asked about our snacks saying that her nephew always comes home from preschool talking excitedly about kiwi or whatever the focus fruit/veggie of the day was. She was really impressed with how healthy the snacks are and wanted to know how we managed to do it.”

“I think that by learning about the food and doing an activity about the food helps the children want to try it. I’ve found that even if some children don’t want to try the new food they still have a positive attitude about it.”

“Besides helping children be more willing to try new foods, this nutrition program has also helped them become educated about where the food they eat comes from or how it grows. It seems like more and more people don’t have that knowledge about less common foods.”

“It really gave children a greater knowledge of different foods. They tried it, and they were able to distinguish between the different flavors that they may or may not have tried.”

Recipes:

“Some of the recipes were not very ‘child friendly.’ Serving a child a plate of roasted onions as a snack isn’t very filling for the child, and most people don’t just eat plain roasted onions.”

“Many of the recipes aren’t what I would consider kid-friendly food (and at times not even really adult friendly). Things like personal fruit pizzas and smoothies are not only kid friendly but more filling than something like plain fried onions. Also, it’s hard to find the time, money, and staff for some of the more time consuming/elaborate recipes. We have to keep prep time to 30 minutes or less and something only one person can handle alone.”

“For teachers doing it, they may want to try unfamiliar recipes ahead of time, to get an idea of what to do to make them work in the classroom (in case they need to adjust amounts for ingredients, cooking time, etc.).”

“The problem will be with preparation. Most programs open a box of fish crackers and a bottle of apple juice. It is very easy to do even with 20 kids clamoring for a snack. Many programs just don’t have the staff to prepare something that takes more effort. The cost will also be more for fresh fruits and veggies than an off-brand cracker. If you can find a way to offer healthier snacks that cost the same and need little prep (or can be prepped ahead) you might meet with less reluctance.”

Discussion

All three types of activities included in *Food Sense Kids* were successful at engaging the children. The overall results showed that arts/crafts activities had significantly more participation than reading/writing and physical activities, which suggests that arts/crafts activities may offer the greatest opportunity to teach food concepts within a nutrition curriculum.

No differences were detected between facilities for child food neophobia or parent food neophobia. Data collected from children and parents about child food preferences showed no significant differences between facilities. These results suggest that FSK influenced food neophobia and food preferences in the same way across facilities despite differences in nutrition related policies. Factors such as taste modeling by teachers, family style service, and teacher food neophobia may influence food neophobia and food preferences in children attending different facilities, so future studies that include larger sample sizes may be able to better detect whether the nutrition environment in child care facilities has a significant impact on the neophobic response in preschoolers.

FSK was successful at significantly increasing food knowledge in both facilities despite differences in baseline knowledge levels. Children attending facility 2 had significantly lower knowledge at baseline when compared with children from facility 1. Knowledge scores at each facility did increase significantly, but knowledge of facility 2 children increased at a significantly higher rate than children at facility 1. It is also noteworthy to add that facility 2 received fewer lessons from FSK than did facility 1 and knowledge still increased at a significantly higher rate. The differences in baseline knowledge levels between facilities may be due to the general approach to nutrition at each facility, differences in type or number of nutrition related lessons taught prior to the study period, the variety of foods served at meals and snacks prior to the study, differences in teacher participation at snacks prior to and during the study, or other unknown factors.

Teacher feedback was very positive about FSK and its effects on children and indicated that teachers believed the curriculum was effective. According to teacher feedback, all of the teachers agreed that the curriculum was engaging and could be easily implemented into a variety of programs and that the familiarity with and knowledge of a wider variety of foods increased in the majority of their students as well as themselves. Also, almost 90% of teachers agreed the recipes included in the curriculum could be easily implemented into a variety of programs and that the willingness of their students and themselves to try new, unfamiliar foods had increased. Every teacher also agreed that introducing children to unfamiliar foods is a necessary part of nutrition education and that providing a positive atmosphere and showing willingness to try new foods as a teacher

affects child willingness to try new foods, which suggests teachers agreed with the importance of a neophobia related nutrition curriculum.

Teachers identified specific areas where improvements could be made. Some commented that some recipes were not 'kid-friendly' and others were concerned about the staff, time, and money required to incorporate diverse foods and recipes into snack time. The concern over kid-friendly recipes may be due to the unfamiliarity of many of the study foods, which emphasizes the importance of gaining teacher understanding and cooperation when applying a curriculum of this type. Extension professionals that have nutrition knowledge can help preschool educators understand the value of introducing children to a wide variety of unfamiliar foods including foods that are not typically considered kid friendly. The concerns over effort required to implement the program may have been due to the fact that the lessons were taught and the snacks were prepared by the graduate instructors and volunteer dietetics students. However, teacher background information is incorporated into FSK to help teachers feel increased confidence in purchasing, educating about, and preparing unfamiliar foods.

The application and evaluation of the FSK curriculum offered an understanding of best practices to apply when implementing nutrition education to preschoolers. When these best practices are implemented they can improve children's interest in nutrition as well as increase their willingness to taste novel foods and overall food acceptance.

- Recipes in preschool nutrition education curriculum should be easy to prepare, be minimally time consuming, and be kid-friendly.
- Curriculum should incorporate a wide variety of foods including fruits, vegetables, and whole grains.

- The responsibility of teachers is to prepare and serve snacks, the responsibility of children is to decide how much to eat or if they eat at all (Satter, 1995). Teachers should encourage children to taste foods, but refrain from attempting to control portion sizes or force children in any way to eat.
- Allow children to explore food items as much as possible by including opportunities to touch and smell.
- Allow children to assist in food preparation whenever possible. This can increase their willingness to taste those foods.
- Involving children in food-related activities works well to teach food concepts.
- Maintaining a positive environment at meals and snacks, especially those which contain novel foods can help increase acceptance of that food.
- Teachers should maintain positive attitudes and behaviors toward novel foods, and refrain from speaking or acting negatively about those foods to avoid negatively impacting child food acceptance.
- Gaining support, understanding, and cooperation from classroom teachers is essential when implementing a neophobia related curriculum.
- Teachers should eat with the children to model tasting novel foods and to demonstrate appropriate reactions to novel foods they do not enjoy.
- Children should be exposed to a novel food multiple times to affect food preferences.
- Meals and snacks should be served family style, and children should be allowed to serve themselves portion sizes they choose. This sense of control can encourage tasting of novel foods.
- Children should be made aware of ingredients in snack recipes.
- Praise children for tasting foods rather than for having specific preferences in order to encourage consumption without punishment or reward.

Conclusions and Implications

Results from the evaluation of FSK indicate that it was successful at engaging children, yielding equally effective results across settings in measures of food neophobia, preferences, and knowledge, and was easy to implement. Teachers were also especially supportive of the program and its effects on children.

Future studies that include a greater number of participants, diverse child care facilities, and include repeated taste exposures may be able to better detect whether factors such as taste modeling, family style service, teacher food neophobia, and implementation of best practices will affect childhood food neophobia and/or food preferences.

Future studies may also benefit from measuring teacher neophobia when implementing a preschool nutrition curriculum like FSK to determine the effect that willingness of teachers to prepare and consume foods that are unfamiliar to them has on the neophobia and preferences of their students, especially because past literature has shown that preschool age children are significantly more likely to consume a novel food if it is also being eaten by teachers (Addessi et al., 2005).

Extension professionals and childhood educators should implement nutrition curriculum such as FSK that exposes children to a wide variety of healthy foods to enhance learning and provide positive food experiences to influence children to adopt healthy eating behaviors at a young age. Preschool nutrition curriculum should also implement best practices to help increase children's interest in food and nutrition as well as increase their willingness to taste novel foods and their overall food acceptance.

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CHAPTER 4

CONCLUSION AND FUTURE DIRECTIONS

INTRODUCTION

Food neophobia is a fear of new, unfamiliar foods that is inherent in young children, specifically of preschool age. It can be generally defined as the avoidance of or the reluctance to eat foods that are novel or unfamiliar (Dovey et al., 2008, Raudenbush & Frank, 1999). Food neophobic children like fewer foods, dislike more foods, have tried fewer foods, and prefer a narrower range of foods than their neophilic counterparts (Russell & Worsley, 2008). Greater levels of neophobia are associated with lower consumption of fruits and vegetables (Wardle & Cooke, 2008).

It has been shown that early exposure to a variety of foods may reduce the degree of neophobia in young children (Galloway et al., 2003), which is evidence of the need of nutrition related interventions in preschool age that focus on reducing neophobia and improving children's eating habits at a young age. Child care providers in particular have the opportunity to influence food acceptance, food preferences, and eating habits now more than ever due to the increasing percentage of children who attend full time child care. An estimated 82% of children younger than six years of age are in care outside of the home (Briley & McAllaster, 2011). Nutrition education interventions are especially needed because nutrition standards can vary considerably between child care facilities (Van Horn, 2011). Many child care homes offer little fruits and vegetables, often serve sweet snacks, and include meals and snacks that exceed the recommended limit for saturated fat (Larson et al., 2011).

Extension educators who have nutrition knowledge can be invaluable in this process, especially because many child care providers lack knowledge and training in nutrition (Dunn et al., 2006). Extension educators can also help child care providers implement certain best practices when applying a nutrition education curriculum in order to improve learning, engage children, and increase willingness to taste novel foods.

PROJECT SUMMARY

Data was collected from the testing and evaluation of an interactive nutrition education curriculum, *Food Sense Kids*, that specifically targeted neophobia in three to five year old children. It was tested at two child care facilities using baseline and post-intervention surveys and included 51 participants. The study examined whether the *Food Sense Kids* nutrition education curriculum, implemented as a series of whole food based nutrition education lessons, would effect changes in food neophobia in three to five year old children participating in preschool child care. The curriculum was also evaluated on its ability to engage children, be effective across multiple settings, and be easily implemented into a variety of preschool programs. The evaluation of *Food Sense Kids* allowed researchers to elucidate best practices to apply when implementing a nutrition curriculum to preschool children.

Curriculum Description

Food Sense Kids is an interactive nutrition education curriculum that is designed for preschool children three to five years of age to increase their familiarity with and knowledge of a wide variety of foods. The curriculum consisted of a total of 33 lessons, with 23 vegetable, 8 fruit, and 2 grain.

Each lesson focused on one food and included a classroom introduction and discussion, one reading/writing (RW) activity, one physical activity (PA), one arts and crafts activity (AC), two snack recipes, pictures of the food and how it grows, and a handout to be copied and given to parents to take home. The parent handout included the two snack recipes used in the lesson as well as some helpful tips for buying, storing, and preparing the food in order to encourage consumption at home.

Introduction/Discussion

In the introduction, the instructor allows the children to pass around a sample of the food to see, touch, and smell. A basic discussion about the food would follow, including the way the food grows, which parts of the food can be eaten, as well as different ways the food could be prepared and eaten, all of which were illustrated using pictures. The introduction and discussion were designed to last from five to ten minutes.

Activities

Activities were designed to relate to the theme food and teach specific concepts about the food. The AC activities mainly involved skills such as cutting, gluing and coloring. Physical activities involved motions like jumping, skipping, hopping, and running in place. Examples of RW activities include story time with books related to the theme food, letter and word recognition, practice letter writing and matching games. The majority of the lessons were designed to be conducted indoors and therefore required little space. Each of these activities was designed to last 10 to 15 minutes.

Snacks

The two snack recipes included in the lesson each incorporated the theme food using different ingredients and cooking methods, allowing children to see and sample the foods prepared in different ways. Recipes were included with the goal of allowing children to participate in all or portions of the recipe preparation, which would allow children to be completely aware of the ingredients in the recipe and to be more likely to sample it. Snack time would typically require 30 to 45 minutes to complete.

Curriculum Implementation

The components of each lesson were divided and taught in the am and pm in order to allow children attending only half-day care to receive each lesson. In the am, the class introduction/discussion would be delivered and children would participate in one or two activities. Directly after the activities children would eat the snack, which utilized one of the recipes included in the lesson. In the pm, the class introduction/discussion would be delivered again and children would participate in the remaining one or two activities. Each lesson only included three activities, so if one activity was implemented in the am, the remaining two would be implemented in the pm and vice versa. Activities were alternated between days so that each half-day child was able to participate in each type of activity. Directly after the pm activities, snack would be administered using the second recipe included in the lesson.

At each center, a classroom teacher or graduate instructor would eat with the children in order to model appropriate eating behaviors. Children were also encouraged to taste every snack and only praised for tasting and not for having a specific preference.

PROJECT CONCLUSIONS

Results from the evaluation of FSK indicate that it was successful at engaging children, yielding equally effective results across settings in measures of food neophobia preferences, and knowledge, and was easy to implement. Teachers were also especially supportive of the program and its effects on children. The evaluation of the FSK curriculum offered an understanding of best practices to apply when implementing nutrition education to preschoolers. When best practices are implemented they can improve children's interest in nutrition as well as increase their willingness to taste novel foods and overall food acceptance.

Findings from the study suggest that *Food Sense Kids* was successful at increasing child food knowledge, indicating that child care centers can be important in teaching children about food and nutrition. FSK did not significantly reduce food neophobia; however results suggest that future studies which incorporate larger sample sizes or multiple exposures to individual novel foods may be successful in decreasing preschool food neophobia. Overall, children desired to be continually exposed to the FSK foods and parents were positive about the effects of the program on their children, suggesting that an interactive nutrition curriculum such as FSK can positively impact healthy eating behaviors in preschool children. Future studies may benefit from exploring additional ways to incorporate parental involvement to encourage healthy eating habits in the home as well as the child care environment.

Extension professionals and childhood educators should implement nutrition curriculum such as FSK that exposes children to a wide variety of healthy foods to enhance learning and provide positive food experiences to influence children to adopt

healthy eating behaviors at a young age. Preschool nutrition curriculum should also implement best practices to help increase children's interest in food and nutrition as well as increase their willingness to taste novel foods and their overall food acceptance. The best practices that were put together as a part of this study should help researchers in the future when implementing a nutrition curriculum in the preschool age group. These best practices were:

- Recipes in preschool nutrition education curriculum should be easy to prepare, be minimally time consuming, and be kid-friendly.
- Curriculum should incorporate a wide variety of foods including fruits, vegetables, and whole grains.
- The responsibility of teachers is to prepare and serve snacks, the responsibility of children is to decide how much to eat or if they eat at all (Satter, 1995). Teachers should encourage children to taste foods, but refrain from attempting to control portion sizes or force children in any way to eat.
- Allow children to explore food items as much as possible by including opportunities to touch and smell.
- Allow children to assist in food preparation whenever possible. This can increase their willingness to taste those foods.
- Involving children in food-related activities works well to teach food concepts.
- Maintaining a positive environment at meals and snacks, especially those which contain novel foods can help increase acceptance of that food.
- Teachers should maintain positive attitudes and behaviors toward novel foods, and refrain from speaking or acting negatively about those foods to avoid negatively impacting child food acceptance.
- Gaining support, understanding, and cooperation from classroom teachers is essential when implementing a neophobia related curriculum.
- Teachers should eat with the children to model tasting novel foods and to demonstrate appropriate reactions to novel foods they do not enjoy.
- Children should be exposed to a novel food multiple times to affect neophobia and preferences.
- Meals and snacks should be served family style, and children should be allowed to serve themselves portion sizes they choose. This sense of control can encourage tasting of novel foods.

- Children should be made aware of ingredients in snack recipes.
- Praise children for tasting foods rather than for having specific preferences in order to encourage consumption without punishment or reward.

Parent feedback was collected in the study, and only a few comments were used in chapter 2. Other parent comments are included below:

“I think you handled my daughter’s very stubborn nature to try new foods well. While she is picky, I think she has become more willing to try new foods lately—but not the ones that were given in the study.”

“You appear to only be looking at one parent’s influence on kids eating. While I tend to eat more F&V’s and new foods, my husband does not. My kids both tend to follow his eating style in spite of my efforts to get them to eat healthier foods. The lessons were a great confirmation that I am doing what I should and can. Hopefully eventually they will all eat better.”

“When doing a study on children, I would suggest more kid-friendly recipes. I felt that the study was better suited towards adults not children.”

“My daughter talked a lot about these food experiences. She recognized the names of foods in the store and asked for some of them at home.”

“My son pointed out the new foods at the grocery store on more than one occasion.”

“I think the program is great! The recipes are very useful! Thank you! My son loved being exposed to different foods, even though he didn’t always try them.”

“Asked to make several items that were made at school and talks a lot about what she’s learned about different foods – very fun to hear!”

“Do it all year, every year! Come to public schools!”

“This small change is actually a pretty big step for my daughter as before she just avoided even talking about new foods so thanks and keep up the good work.”

“She wants to try edamame at home.”

“My son made me buy garbanzo beans and cook them the next day.”

“My son normally doesn’t like potatoes but after trying the potato soup recipe he told me that if I could make potatoes taste like that – he would eat them every day! So, thanks for the potato soup recipe.”

“One day at the store my daughter wanted a rutabaga. She was very sad that the store didn’t have one. I wanted to encourage her to like new things so we tried a couple of stores. Alas, no rutabagas. With maybe a couple of exceptions (rutabaga & jicama) she hasn’t changed her eating habits that much. But it’s easier to get her to try something.”

“I notice that she likes new foods when her friends are eating it too. But at home she is more finicky. We have been trying to get her to eat tomatoes for a while. She said she liked the tomatoes at school. But she doesn’t like them at home. So the school environment was good for trying things.”

“He recognized a lot of vegetables at the grocery store, and he is always curious about whether or not the foods he eats is healthy.”

“He would notice the take home sheets and talk about it a little.”

“My daughter has taken an interest in cooking and is much more determined to eat what she makes. She now tries a little of everything without even being asked. She asks me how good certain foods are for her.”

“I have loved hearing about the new foods/recipes that the Kelsey’s share with my daughter’s class. As a parent, I appreciate the emphasis on nutritious whole foods.”

“I love that he now tells his 3 year old sister, the picky eater in the family, she can’t say she doesn’t like it if she has never tried it before. Not many fruits or veg. were new to us (except rutabagas and jicama), but I LOVE that he was exposed to a variety of ways to prepare the fruits and vegetables we already eat. He tends to choose plain vegetables like corn on the cob vs. a corn salsa. More exposure to food mixed up was good for him!”

“My daughter has been more willing to try new foods at home as a result of trying them at school. She comes home and sees that we had green beans in our freezer and talked about how she had them at school.”

“She identified a mango at the grocery store by pointing to it an aisle away.”

“The nutrition info and snack variety has tremendously enhanced my daughters learning and attitude towards new food.”

“I was always surprised at the foods he knew. ‘Look mom, asparagus!’ ‘Jicama! I tried that!’ Pineapple has been added to our meals. Yay! He has not been as difficult with new foods and every so often even says yum!”

“This was such a great thing. I wish this could be done in every school. It really made a difference, thank you!”

“My daughter loved the potato soup and many other food items. I’ve made many of the recipes several times.”

“We made a recipe book out of the sheets that were sent home. My daughter loves to pick a recipe or information sheets to pick things from a grocery store. She’s excited to have her own recipes to pick from and help contribute to meals with her own ideas. I have enjoyed her growth from this program!”

“We are vegetarians, we don’t eat fish/eggs/meat. It would be great if you guys add some protein products/recipes for young kids.”

“While my son’s food preferences didn’t change a lot, he really enjoyed trying new foods and ‘reported’ back regularly on what he had eaten at school. We are lucky that he has always eaten a wide range of foods and often eats his vegetables first from his plate.”

“The couscous recipe has become one of our favorites! We have appreciated having new things to try at home.”

“We have really appreciated this opportunity, the kids have benefited greatly from your study. I think all the components were important in learning/trying new food, but especially taking the time to prepare a recipe and present the food in an appetizing way. This was an amazing effort on your part.”

“There are many great types of grains that would be interesting to include such as bulgur, brown rice. Wheat is good, but perhaps people are already familiar with that one. Also other things like legumes—split peas, lentils.”

“My son is really interested in produce now. He asks for items we don’t usually buy, and we get them for him. He is really interested in cooking now and wants to help in the kitchen.”

“Great program! I did notice he came home with some new food refusals though, I guess from hearing other kids, but we quickly got him eating them again.”

“Keep it up! I love having fresh and interesting food for my son at school. Most school food in general seems awful.”

SUGGESTIONS FOR FUTURE PROGRAM DEVELOPMENT

During the course of the project, the graduate researcher made notes that warrant mention here for future implementation of *Food Sense Kids*:

- Future studies that include larger sample sizes may be able to successfully reduce food neophobia in preschool children without using multiple exposures to individual foods by implementing FSK over an extended period of time.
- Future application of FSK may need to include the selection of a smaller number of lessons from within the overall curriculum to implement over an extended period of time emphasizing multiple taste exposures to each food in order to successfully reduce food neophobia and increase food preferences in preschoolers.
- Including measurements of teacher neophobia may be an important element in determining how their students will ultimately be affected by a neophobia related nutrition curriculum. Teachers with higher food neophobia may be less successful at reducing neophobia in their students despite the use of a curriculum such as FSK.
- The inclusion of an additional instrument to measure food neophobia besides the Child Food Neophobia Survey, such as a food acceptance survey that measures if the food was touched, smelled, tasted, spit out, etc. may be able to demonstrate changes in food acceptance in children based on classroom experience.
- Include incentives to parents when possible for recruitment of participants and for returning paperwork.
- Face to face contact with parents allowed them to become more familiar with the research project and its overall objectives, and ultimately ensured that paperwork was completed quickly and correctly. Parents who received more face to face contact also seemed to be more invested in the study outcomes and would implement the curriculum recipes at home.
- Having a meeting with administrators, teachers, and aides who will be directly involved in study implementation is essential to gaining their understanding, cooperation, and support. Teachers can offer valuable support and their attitudes ultimately have a great impact on their students.

- Make sure that all paperwork includes a space for the participant's name and/or study ID. Multiple spaces to include a name are even good to include ensuring you do not get completed paperwork from an unknown participant.
- Include simple yet detailed instructions on all paperwork so participants clearly understand the information you are seeking from them.
- If gathering food knowledge data from children, include an option on the survey to indicate whether a child can identify the food name from a picture. Also include an option for when a child can identify a food name but does not have a specific preference.
- When interviewing children one-on-one, do it in a quiet environment where they are not distracted by classroom activities, classmates, etc.
- When collecting food preference data, be as specific as possible. Asking about foods like "dried fruit" or "wheat" will not give accurate information.

FINAL CONCLUSIONS

Overall, many young children are unfamiliar with a diverse number of healthy foods due to lack of exposure and opportunity to try a diverse number of foods. Children are dependent on educators, parents, and adults to give them those opportunities.

Implementation of *Food Sense Kids* with the use of best practices can help children become more familiar with a broad range of healthy foods which many children may not otherwise be exposed to. If children are given the opportunity to sample a wide variety of foods at a young age, their knowledge about foods will increase, they may become less neophobic, and may ultimately seek out new food experiences, enjoy healthy foods and develop healthy eating habits that can last a lifetime.

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APPENDICES

Appendix A. Child Food Preference Survey

CHILD Food Preference Survey

NAME:

How much do you like these foods?				
	Do not like this	Like this a little	Like this a lot	Don't know what this is
				
Avocado	0	0	0	0
Lettuce	0	0	0	0
Spinach	0	0	0	0
Bell Pepper	0	0	0	0
Pineapple	0	0	0	0
Onions	0	0	0	0
Potatoes	0	0	0	0
Grapefruit	0	0	0	0
Sweet Potato	0	0	0	0
Eggplant	0	0	0	0
Kiwi	0	0	0	0
Jicama	0	0	0	0
Garbanzo Beans	0	0	0	0
Tomatoes	0	0	0	0
Black Beans	0	0	0	0
Couscous	0	0	0	0
Pears	0	0	0	0
Zucchini	0	0	0	0
Asparagus	0	0	0	0
Coconut	0	0	0	0
Carrots	0	0	0	0
Mushrooms	0	0	0	0
Strawberries	0	0	0	0
Alfalfa Sprouts	0	0	0	0
Artichokes	0	0	0	0
Corn	0	0	0	0
Squash	0	0	0	0
Green Beans	0	0	0	0
Mangoes	0	0	0	0
Edamame	0	0	0	0
Dried Fruit	0	0	0	0
Rutabagas	0	0	0	0
Whole Wheat	0	0	0	0

Appendix B. Parent Food Preference Survey

Food Preference Sheet

NAME:

Parent - Please fill out what you believe **your child's** food preferences are.

	Do not like this	Like this a little	Like this a lot	Don't know what this is
				
Avocado	0	0	0	0
Lettuce	0	0	0	0
Spinach	0	0	0	0
Bell Pepper	0	0	0	0
Pineapple	0	0	0	0
Onions	0	0	0	0
Potatoes	0	0	0	0
Grapefruit	0	0	0	0
Sweet Potato	0	0	0	0
Eggplant	0	0	0	0
Kiwi	0	0	0	0
Jicama	0	0	0	0
Garbanzo Beans	0	0	0	0
Tomatoes	0	0	0	0
Black Beans	0	0	0	0
Couscous	0	0	0	0
Pears	0	0	0	0
Zucchini	0	0	0	0
Asparagus	0	0	0	0
Coconut	0	0	0	0
Carrots	0	0	0	0
Mushrooms	0	0	0	0
Strawberries	0	0	0	0
Alfalfa Sprouts	0	0	0	0
Artichokes	0	0	0	0
Corn	0	0	0	0
Squash	0	0	0	0
Green Beans	0	0	0	0
Mangoes	0	0	0	0
Edamame	0	0	0	0
Dried Fruit	0	0	0	0
Rutabagas	0	0	0	0
Whole Wheat	0	0	0	0

Appendix C. Parent Feedback Survey

Name:

PARENT/GUARDIAN: Please circle the response that best describes how strongly you agree or disagree with the following statements regarding *YOUR CHILD*:

My child is more willing to try new, unfamiliar foods as a result of their participation in the nutrition study.

Strongly Disagree Disagree Neutral Agree Strongly Agree

I have seen changes in my child's food preferences as a result of their participation in the nutrition study.

Strongly Disagree Disagree Neutral Agree Strongly Agree

My child is more willing to eat vegetables as a result of their participation in the nutrition study.

Strongly Disagree Disagree Neutral Agree Strongly Agree

My child's knowledge about different foods has increased as a result of their participation in their study.

Strongly Disagree Disagree Neutral Agree Strongly Agree

My child has expressed a desire to eat the foods they have been introduced to in the nutrition study. (Refer to food preference sheet for list of foods taught in the study).

Strongly Disagree Disagree Neutral Agree Strongly Agree

PARENT:GUARDIAN: Please circle the response that best describes how strongly you agree or disagree with the following statements regarding *YOU*.

I am more familiar with a wider variety of foods as a result of my child's participation in the nutrition study.

Strongly Disagree Disagree Neutral Agree Strongly Agree

I am more willing to try new, unfamiliar foods as a result of my child's participation in the nutrition study.

Strongly Disagree Disagree Neutral Agree Strongly Agree

My child's participation in the nutrition study has affected the foods purchased and/or eaten in our home.

Strongly Disagree Disagree Neutral Agree Strongly Agree

My child and I have discussed the foods they learned about during the study.

Strongly Disagree Disagree Neutral Agree Strongly Agree

The take home messages that include recipes are useful to me/my family.

Strongly Disagree Disagree Neutral Agree Strongly Agree

**Any stories or experiences related to my child's participation in the nutrition study
(i.e. recognizing new foods at the grocery store, asking to make recipes from snacks at home, etc.):**

Additional Comments:

Suggestions for the future:

Appendix D. Child Food Neophobia Survey (Child version)

NAME:

PARENT/GUARDIAN: Please circle the response that best describes how strongly you agree or disagree with the following statements regarding **YOUR CHILD**.

1. Does your child have any food allergies?

Yes No

If yes, please list below:

2. My child is:

Male Female

3. I would describe my child as:

White

Hispanic

Black or African American

American Indian or Alaska Native

Asian

Native Hawaiian or Other Pacific Islander

4. My child does not trust new foods.

Strongly Disagree Disagree Agree Strongly Agree

5. If my child doesn't know what's in a food, he or she won't try it.

Strongly Disagree Disagree Agree Strongly Agree

6. My child is afraid to eat foods he or she has never had before.

Strongly Disagree Disagree Agree Strongly Agree

7. My child will eat almost anything.

Strongly Disagree Disagree Agree Strongly Agree

8. My child is very particular about the foods he or she will eat.

Strongly Disagree Disagree Agree Strongly Agree

9. My child tries new and different foods often.

Strongly Disagree Disagree Agree Strongly Agree

Appendix E. Child Food Neophobia Survey (Parent version)

NAME:

PARENT/GUARDIAN: Please circle the response that best describes how strongly you agree or disagree with the following statements regarding YOU.

1. **My gender is:**
Male Female
2. **My age group is:**
Under 20 20-30 31-40 40-50 Over 50
3. **What is the highest level of education you have completed?**
Some High School, but no diploma
High School
Some college, but no degree
Associate's Degree
Bachelor's Degree
Graduate work or higher
4. **I would describe myself as:**
White
Hispanic
Black or African American
American Indian or Alaska Native
Asian
Native Hawaiian or Other Pacific Islander
5. **I do not trust new foods.**
Strongly Disagree Disagree Agree Strongly Agree
6. **If I don't know what's in a food, I will not try it.**
Strongly Disagree Disagree Agree Strongly Agree
7. **I am afraid to eat foods I have never had before.**
Strongly Disagree Disagree Agree Strongly Agree
8. **I will eat almost anything.**
Strongly Disagree Disagree Agree Strongly Agree
9. **I am very particular about the foods I will eat.**
Strongly Disagree Disagree Agree Strongly Agree
10. **I try new and different foods often.**
Strongly Disagree Disagree Agree Strongly Agree

Appendix F. Teacher feedback survey

Name:

Please describe your position (full-time teacher, aide, etc.):

Circle the response that best describes how strongly you agree or disagree with the following statements:

Nutrition education that introduces children to new, unfamiliar foods is necessary in the preschool setting.

Strongly Disagree Disagree Neutral Agree Strongly Agree

The nutrition related activities presented in this study were developmentally appropriate for the 3-5 year age group.

Strongly Disagree Disagree Neutral Agree Strongly Agree

The nutrition related activities presented in this study were effective at engaging the children.

Strongly Disagree Disagree Neutral Agree Strongly Agree

The nutrition related activities could be easily implemented into a variety of preschool programs.

Strongly Disagree Disagree Neutral Agree Strongly Agree

The recipes/snacks used in this study could be easily implemented into a variety of preschool programs.

Strongly Disagree Disagree Neutral Agree Strongly Agree

Maintaining a positive environment at snack time impacts child food acceptance.

Strongly Disagree Disagree Neutral Agree Strongly Agree

My willingness to try new foods as a teacher affects the willingness of the child to try new foods.

Strongly Disagree Disagree Neutral Agree Strongly Agree

I am more willing to try new, unfamiliar foods as a result of my participation in the nutrition study.

Strongly Disagree Disagree Neutral Agree Strongly Agree

I am more familiar with a wider variety of foods as a result of my participation in the nutrition study.

Strongly Disagree Disagree Neutral Agree Strongly Agree

My knowledge about different foods has increased as a result of my participation in the nutrition study.

Strongly Disagree Disagree Neutral Agree Strongly Agree

The majority of the children in my class are more willing to try new, unfamiliar foods as a result of their participation in the nutrition study.

Strongly Disagree Disagree Neutral Agree Strongly Agree

The majority of the children in my class are more familiar with a wider variety of foods as a result of their participation in the nutrition study.

Strongly Disagree Disagree Neutral Agree Strongly Agree

The children's knowledge about different foods has increased as a result of their participation in the nutrition study.

Strongly Disagree Disagree Neutral Agree Strongly Agree

The children in my class discuss the foods they learned about in the nutrition study.

Strongly Disagree Disagree Neutral Agree Strongly Agree

**Any stories or experiences related to my child's participation in the nutrition study
(i.e. recognizing new foods at the grocery store, asking to make recipes from snacks at home, etc.):**

Additional Comments:

Suggestions for the future: