

PRESCHOOL NUTRITION EDUCATION DURING MEALTIME AND  
FINE MOTOR DEVELOPMENT ASSESSMENT:  
A *CAMINITOS* COLLABORATIVE STUDY

by

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## TABLE OF CONTENTS

	<b>Page</b>
ACKNOWLEDGEMENTS.....	iv
LIST OF TABLES.....	viii
LIST OF FIGURES .....	ix
LIST OF ABBREVIATIONS.....	x
 CHAPTER	
I. INTRODUCTION.....	1
BEST FOOD FITS AND CAMINITOS.....	2
II. LITERATURE REVIEW.....	3
EARLY FEEDING.....	3
RECOMMENDED FEEDING PRACTICES DURING EARLY FEEDING .....	3
CURRENT FEEDING GUIDELINES IN THE UNITED STATES .....	5
SCHOOL READINESS.....	6
Fine motor skills importance on school readiness .....	6
MOTOR SKILLS AND RACE/ETHNICITY .....	9
MOTOR SKILLS AND OVERWEIGHT/OBESITY .....	9
FEEDING BEHAVIORS AND MOTOR SKILLS .....	10
CONCERNS ON CHILD NUTRITION AND SCHOOL READINESS.....	11
Child Nutrition: Statistics, Ramifications, and Causes of	
Childhood Obesity .....	11
Ramifications of childhood obesity .....	12
Causes of childhood obesity .....	12
HOME AND SCHOOL ENVIRONMENT CONCERNS ON CHILD NUTRITION .....	13
Home environment: parents.....	13
School Environment: Caregivers .....	16
Prekindergarten for All .....	17
Head Start.....	18
INTERVENTIONS AIDING IN CHILD DEVELOPMENT .....	19
Child and Adult Care Food Program (CACFP).....	20
THEORIES.....	21

Social Cognitive Theory (SCT) .....	21
Social Ecological Model (SEM) .....	22
OBJECTIVES .....	25
Purpose of Study .....	25
Research Questions and Objectives .....	25
III. METHODS .....	27
INSTITUTIONAL REVIEW BOARD .....	27
CLASSROOM COMPONENT.....	27
Teacher Surveys.....	27
Classroom Mealtime Observations .....	28
TEACHER QUALITATIVE INTERVIEWS .....	29
MEALTIME LESSON MODULES DEVELOPMENT, IMPLEMENTATION, AND EVALUATION .....	30
HOME COMPONENT.....	32
Photo Texting and educational materials for guardians.....	32
HOME AND CLASSROOM COMPONENT .....	33
Post-activity Evaluations .....	33
FIDELITY CHECK THROUGH POST-ACTIVITY EVALUATIONS .....	33
DATA ANALYSIS .....	34
IV. MANUSCRIPT.....	36
ARTICLE TITLE .....	36
INTRODUCTION .....	36
METHODS .....	37
Theory .....	38
PARTICIPANTS AND RECRUITMENT .....	38
MEASURES AND PROCEDURES .....	40
Classroom Component.....	40
Home component .....	43
Home and Classroom component .....	44
DATA ANALYSIS .....	45
RESULTS .....	46
Teacher Survey Results.....	46
Pre-Intervention Teacher Interview Findings .....	48
Guardians Demographics.....	49

Pre-Intervention Mealtime Observations .....	50
Teacher Post-activity Findings .....	50
Guardians Post-Activity Findings.....	52
Classroom Observations, Field Notes, and Comments from Post- Activity Evaluations.....	53
DISCUSSION .....	55
LIMITATIONS.....	58
IMPLICATIONS FOR RESEARCH AND PRACTICE .....	59
V. CONCLUSION.....	60
APPENDIX SECTION.....	62
REFERENCES .....	71

## LIST OF TABLES

Table	Page
1. Six-week lesson modules practiced at home and school environment.....	32
2. Teacher survey data .....	47
3. Constructs and themes in teacher interviews (n=11) .....	48
4. Post-activity evaluation responses among teachers weekly.....	52
5. Post-activity evaluation responses among guardians weekly .....	53
6. Themes of observations, field notes and evaluation feedback in classrooms.....	54
7. Themes of observations, field notes and evaluation feedback in homes .....	55



## LIST OF FIGURES

Figure	Page
1. Ecological framework and the multiple influences on a child's nutrition .....	24
2. Conceptual model addressing the built environment and child .....	26
3. Model incorporating the levels of influence using theory .....	58

## **LIST OF ABBREVIATIONS**

<b>Abbreviations</b>	<b>Description</b>
US	United States
CVD	Cardiovascular Disease
Best Food FITS	Best Food for Families, Infants, and Toddlers
AAP	American Academy of Pediatrics
RWJF	Robert Wood Johnson Foundation
WHO	World Health Organization
UNICEF	United Nations International Children’s Emergency Fund
HMOs	Human Milk Oligosaccharides
FDA	Food and Drug Administration
HHS	U.S. Departments of Health and Human Services
USDA	United States Department of Agriculture
TGMD-2	Test of Gross Motor Development
BMI	Body Mass Index
BOTMP-SF	Bruininks-Oseretsky Test of Motor Proficiency Short Form
SES	Socioeconomic Status
T2DM	Type 2 Diabetes Mellitus
EPAO	Environment and Policy Assessment and Observation Instrument
MM	Mighty Moves
CACFP	Child and Adult Care Food Program
DGA	Dietary Guidelines of Americans

SCT	Social Cognitive Theory
SEM	Social Ecological Model
MoU	Memorandum of Understanding
NAP SACC	Nutrition and Physical Activity Self-Assessment for Child Care
GED	General Education Diploma

## **I. INTRODUCTION**

Early childhood nutrition and kindergarten readiness are pillars of child development which shed influence of child and adult success.<sup>1,2</sup> Factors including food insecurity, low socioeconomic status, and obesity are problems affecting numerous populations around the world.<sup>3,4,5</sup> In the United States (U.S.), the prevalence of obesity is increasing in Hispanic and Non-Hispanic Black children and adolescents.<sup>3</sup> Alongside obesity, there is the possibility of an increase in the development of health issues such as diabetes and cardiovascular disease (CVD) later in the life. With food insecurity and low socioeconomic status, the purchasing of foods that may display possibly protective benefits against metabolic syndromes may be more difficult to purchase.<sup>3</sup> In addition to the health concerns on a child's development alongside obesity, previous research has also revealed children at an unhealthy weight status and living in low socioeconomic status households may depict a diminishment in their motor skills performance.<sup>5,6</sup> Furthermore, research has indicated a child's motor skills is correlated to their academic performance at current and later years as well as an improved performance in reading and math.<sup>7</sup> To combat any issues displaced by low socioeconomic status Hispanic children, interventions have been used to improve fine motor skills. In addition, previous research has also revealed the use of educational videos as a positive tool to educate families on the importance of early childhood feeding practices.

Due to many problems that may arise alongside food insecurity and poverty, the development of programs has occurred to combat these issues. The development of Head Start by Lyndon B. Johnson was created to help families overcome the cycle of poverty

as well as the development of research initiatives such as the Caminitos Collaborative at Texas State University to help meet the needs of disadvantaged families.

### **Best Food FITS and Caminitos**

Best Food for Families, Infants, and Toddlers (Best Food FITS) is a research program aiming to reduce the risk of obesity in children by increasing the intake of fruit and vegetables as well as decreasing the intake of sugar-sweetened beverages.<sup>8</sup> In 2010, Best Food FITS was created by the Nutrition and Foods faculty and staff in central Texas at Texas State University. Since then, Best Food FITS has revealed the photo-texting method and videos protocol as ways to teach and improve healthful feeding practices.<sup>8</sup>

*Caminitos*, translated to “little roads” is a collaborative established in 2010 to place children on the road to higher education by providing a variety of projects to educate such as assessments within the classroom, involving families, and graduate projects.<sup>9</sup> The Caminitos Collaborative works by improving early childhood education through increasing physical activity, school readiness, knowledge within parents, and nutrition to overall improve the health and wellbeing of children.<sup>9</sup>

As a natural next step, through the Caminitos Collaborative effort, this thesis project aims to improve fine motor skills development through common feeding practices within the preschool and home setting in children from the ages of zero to five. The overall goals of this project include the improvement of fine motor skills, increase awareness and knowledge of the importance of early childhood feeding practices and fine motor skills, as well as increase the child’s autonomy, self-independence, and school readiness.

## **II. LITERATURE REVIEW**

### **Early Feeding**

The first 1,000 days of an infant's life is the most crucial. This time period impacts the development of an infant and shapes their feeding habits for the future. Children learn how much, what, and when to eat based on their experiences and observations of others during mealtime.<sup>1</sup> Providing the essential nutrients during this period may prevent the development of obesity and chronic diseases that can influence the child's life later in life as well as shape children's feeding practices.

The following section will address feeding practices during infancy and beyond. These feeding practices include breastfeeding and formula feeding, the increase needs of certain nutrients as time progresses and complementary feeding.

### **Recommended Feeding Practices during Early Feeding**

According to the American Academy of Pediatrics (AAP), infants should be exclusively breastfed from birth to six months. At four to six months, breastfeeding should be continued alongside complementary foods for at least the first year. In addition, the AAP recommends infants should not be introduced to complementary foods prior to four months of age due to the possibility of issues impacting the immaturity of various systems such as gastrointestinal tract, immune and renal systems as well as the prevention of obesity. Furthermore, the Robert Wood Johnson Foundation (RWJF) agrees with the AAP recommendations on the importance of exclusive breastfeeding until six months of age as the best feeding practice for infants.<sup>10</sup> As for the World Health Organization (WHO) and United Nations International Children's Emergency Fund (UNICEF), they

agree on the recommendations established by both the AAP and RWJF on exclusively breastfeeding for the first six months with the introduction of nutritionally adequate complementary foods around four to six months. Where the recommendations differ is WHO and UNICEF advise breastfeeding should be continued for at least two years or longer.<sup>11</sup> Breastfeeding is believed to be the gold standard of feeding for infants because of the short-term and long-term benefits for mothers and their infants.<sup>12</sup> In addition, breastfeeding has exceptional components that differentiate it from formula such as Human Milk Oligosaccharides (HMOs) and antibodies. The unique make-up of HMOs act as a prebiotic within infants where they can aid in the development of the immune system by preventing the attachment of pathogens.<sup>13</sup> Breastfeeding plays a vital role in developing an infant's response to hunger, satiation, and self-regulatory abilities.<sup>1</sup> Through the variation of a mother's diet and breastfeeding, an infant is exposed to a variation of flavors and this may affect food acceptance during complementary feeding.<sup>1</sup>

As for choosing the appropriate infant formula based on an infant's needs, it can be a difficult choice among families. Infant formula is regulated by the Food and Drug Administration (FDA) and it is vital for parents to choose an infant formula that is made specifically for their infant's needs and is fortified with iron which is a common practice in the U.S.<sup>14</sup> In addition to choosing the appropriate formula, it is important for families to understand the proper preparation and storage. Families should carefully follow the instructions on the container they decide to choose for their infant. For preparation, families should make sure their hands are washed as well as the bottles are clean and sanitized. Additional precautions should be taken when an infant has a weakened immune system or is born prematurely.<sup>15</sup> Due to the increase amount of protein and commonly

using a bottle during feeding, it is believed formula feeding increases their risk for obesity by disregarding an infant's satiation cues. The total amount of protein in infant formula needs to be reduced and from three to six months, formula fed infants have more body fat and an increase in weight. In addition, formula fed infants have a different gut microbiota than breastfed infants.<sup>16</sup> The differences among the gut microbiome and nutritional status in formula fed infants and breast fed infants may be associated to the increase risk of developing obesity, type 1 and 2 diabetes and CVD later in life.<sup>16</sup>

As an infant continues to grow, breastfeeding or infant formula will not be enough to provide the essential nutrients to meet their needs. To assist with these needs, at four to six months of an infant's life, complementary feeding will be introduced. Complementary feeding is the addition of food alongside breast milk or formula to meet the needs of a developing infant. It is vital to look for certain cues that indicate when the infant is ready. Signs an infant is ready for complementary feeding include the ability to keep their head up, sitting up with little to no support as well as a leaning forward when offered foods. During the first and second year of the infant's life, they will develop the skills needed for feeding. Infants prefer sweet and salty foods at birth.<sup>1</sup> An infant is more likely to prefer and accept sweet and salty foods than bitter foods such as specific vegetables.<sup>1</sup> It is vital to understand children need repeated exposure to accept foods.<sup>1</sup> Currently, in the U.S., there are specific feeding guidelines for children two years old and older.

### **Current Feeding Guidelines in the United States**

Nutrient deficiencies have diminished in the U.S., but rates in chronic diseases have increased due to physical inactivity and a poor diet. Research has shown the proper diet involving healthy eating patterns and physical activity on the regular basis can help



the public maintain good health as well as reduce the incidence of chronic diseases. The Dietary Guidelines are updated every five years by the United States Departments of Health and Human Services (HHS) and Agriculture (USDA) in giving a report to the public about dietary and nutritional information.<sup>17</sup> The Dietary Guidelines are intended for anyone in the public who is two years and older and aims to promote a healthy lifestyle while aiding in the prevention of chronic diseases.<sup>17</sup> This report includes recommendations, physical activity, goals for both macronutrient and micronutrient, sources of food and more. Although they are a vulnerable population, currently, there are no feeding guidelines created for children younger than two years. The next Dietary Guidelines of 2020 will include guidelines for this group.<sup>17</sup>

## **School Readiness**

### *Fine motor skills importance on school readiness*

The beginning of a child's life is one of the most crucial for not only developing healthy eating habits, but also preparing children for academic success.<sup>2,18</sup> The preparation of a child's schooling at an early age is linked to their academic success in later life.<sup>18</sup> In order for a child to partake in everyday activities, social interaction skills, and motor skills, processes are required.<sup>19</sup> Areas of fine motor processes such as those involving visual and motor integration systems are evolving as a vital factor for a child's development in executive functions, self-regulation, and academic success in later years.<sup>18</sup> Executive function is defined as including memory, either attentional or cognitive flexibility as well as inhibitory control.<sup>18</sup> Additionally, visual motor integration is required in certain fine motor skills and tasks such as grasping a pencil and copying

shapes and may be important in early learning as well as cognition. Difficulties and delays in children's achievement appears before they even enter kindergarten or first grade.<sup>2</sup> If children do not have a strong foundation for learning at a young age, a large number of children may start school at a disadvantage.<sup>2</sup>

It is important to understand the connections between development in children and preschool experiences to understand inequality and impact policy making.<sup>20</sup> Perhaps intervening in early development can be the most cost effective.<sup>21</sup> Before kindergarten, there are significant gaps in the development and ability of children living in the United States, these include about 60% of children do not know the alphabet who are low-income compared to one third of middle income children.<sup>2</sup> Additionally, more than 25% of disadvantaged children do not know books are read left to right and where a story begins or ends.<sup>2</sup> Additionally, children spend anywhere from 27% to 66% of fine motor skill activities such as drawing, tracing, threading and cutting. Children with appropriate fine motor skills at kindergarten have a higher math and reading achievement in 5th grade.<sup>20</sup> In addition, socioeconomic status has also been a key indicator to fine motor success, children with high SES have on average better fine motor skills than children who are living in poverty. As for race and gender, girls and Caucasian or Asian children tend to have better fine motor skills than children who are African American and Hispanic.<sup>20</sup>

Writing is a skill essential in preschoolers to succeed in school. Not only is writing a fine motor task, but it also requires use perceptual-motor ability, visual motor integration, hand manipulation, and more. For example, when examining fine motor skills of prekindergarten and kindergarten children, Marr et al stated that 37% compared

to 45% of the school day was spent on fine motor skills respectively.<sup>22</sup> Since fine motor skills are believed to be important in evaluating academic performance, researchers looked at fine motor object manipulation and fine motor writing ability among low socioeconomic children. Results revealed fine motor skills in preschoolers are believed to be important indicators in academic achievement in later years that involve a writing utensil.<sup>6</sup> Fine motor writing ability in preschool is a strong predictor of both achievement in math and reading in second grade than fine motor object manipulation.<sup>6</sup> In addition, studies have also looked at on complex tasks such as folding paper.

Folding paper has been used as subtests to measure fine motor skills and visual-spatial skills during assessments. In addition, to using it as an assessment tool, paper folding has been used as an intervention tool. For example, paper folding has been used in children to improve handwriting as well as spatial abilities in mathematics education.<sup>23</sup> The act of folding paper requires a multitude of skills in several areas among child development. For example, when picking up a piece of paper, a child needs fine motor dexterity, requires stabilization in order to be able to bend the paper, and lastly reinforce the bend into a proper fold.<sup>23</sup> In addition, folding paper requires planning, bimanual coordinational, pinch/grip strength, and control.<sup>23</sup> Travers et al. researched age-related changes in folding paper in children from the ages of 18 months to 7 years old. Within this study, folding paper was defined by the frequency of folds that were declined to attempt when asked, the frequency of attempted folds along line, accuracy, and frequency of different types of errors in folding. Results revealed the youngest age where children were able to complete a measurable fold 1 and 2 was at 2.32 years and fold 3.81 years at three years of

age and gets better with age. In addition, children with age-appropriate problem-solving skills attempted more folds.<sup>23</sup>

### **Motor skills and race/ethnicity**

Due to race and ethnicity having an impact on the weight status of children, researchers have looked at the influence of race and ethnicity on the development of fundamental motor skills in preschool children from low socioeconomic Hispanic households.<sup>24</sup> According to the authors of this study, fundamental skills and object-control skills are crucial and seem to decrease in individuals who do not practice or limit their practice in physical activity. Participants of this study included 111 Hispanic preschool children from the ages of 38 to 52 months who were enrolled in Head Start. Results showed 83% of children scored poor and 17% scored very poor, children enrolled in the Head Start scored lower than the average Test of Gross Motor Development (TGMD-2) norms with large effect sizes. In addition, there were similar deficiencies seen in both boys and girls and researchers stated this study revealed children whom are Hispanic living in poverty are at a risk for a diminish performance of basic movements such as throwing, catching, and striking.<sup>24</sup>

### **Motor skills and overweight/obesity**

Not only is being overweight and obesity status believed to rise the prevalence of comorbidities, but also the lack of motor skills. Overtime, research has shown that preschool children who are disadvantaged display developmental delays. Additionally, a lack of motor competence with a delay in development of motor skills has been

associated to negative implications such as a decrease in physical activity and negative experiences in the classroom.

Among 529 children from the ages of two to four, although there was not a significant difference between weight status in certain skills within an obstacle course used to assess motor skills and physical activity, researchers did see a trend for a lower performance in children in their overall motor skills score.<sup>25</sup> In order to understand the relationship between body weight and motor skill competence in preschool children, researchers looked at children coming from low socioeconomic status households.<sup>26</sup> One hundred and forty-eight children were included in this study using the Peabody Developmental Motor Scales and Body Mass Index (BMI). Results showed there was a significant negative correlation between BMI and visual motor integration. In addition, Hispanic boys had better gross motor skill competence compared to girls who scored higher fine motor skill competence.<sup>26</sup> To assess children of a higher age, researchers looked at the arrangement of events in time between a child's motor skills and weight status at age 5 and age 10. To measure motor skills, gross and fine motor skills were both assessed using the Bruininks-Oseretsky Test of Motor Proficiency Short Form (BOTMP-SF).<sup>27</sup> There were differences revealed among weight status and motor skill performance. At age 10, overweight and obese children scored poorer total and gross motor skills than normal weight children. At age 5, obese children also scored poorer total and gross motor skills. As for fine motor skills, differences were seen in obese and non-obese children.<sup>27</sup>

### **Feeding behaviors and motor skills**

To our knowledge, there are a limited amount of studies done on monitoring an infant's development by assessing their motor skills related to feeding practices. A study

conducted by Carruth and Skinner was done healthy White children, where certain developmental feeding behaviors were monitored using in-home interviews conducted by trained interviewers. These children came from upper SES households with two-parent households. Self-feeding fine motor skills behaviors that were assessed by researchers included children reaching for spoon when hungry, using fingers to rake food toward themselves, using fingers to self-feed soft foods.<sup>28</sup> There were mean age ranges associated with the normal development of children, but when interviewed mothers reported a wide range for when a child evidently achieved these behaviors. Researchers of this article believe it is necessary to counsel about feeding practices for infants.<sup>28</sup> Early childhood intervention efforts might help aid in the prevention of declines in motor proficiency.

### **Concerns on child nutrition and school readiness**

#### *Child Nutrition: Statistics, Ramifications, and Causes of Childhood Obesity*

Throughout the years, the prevalence of childhood obesity has increased in the U.S. and around the world.<sup>3,29</sup> In the U.S., one in every three children and adolescents are either overweight or obese. The increase prevalence of obesity is paired with comorbidities such as type 2 diabetes mellitus (T2DM), sleep apnea, and dyslipidemia.<sup>29</sup> The prevalence of obesity may increase with age and varies by race, ethnicity, and socioeconomic status (SES). Obesity is more common in African American, Mexican-American and American Indian children than non-Hispanic White children and low-income populations.<sup>29</sup> Using the National Health and Nutrition Examination Survey data from 1999 to 2016 to evaluate weight status among U.S. children and adolescents

revealed a significantly higher prevalence rates of overweight and obesity among Hispanic and African American participants than any other race. In addition, there was a sharp increase examined in children from two to five years from 2015 to 2016.<sup>3</sup> Additionally, when assessing the prevalence of obesity among children and adolescents, researchers have also examined children from the ages of three to five years old. When assessing the ages of when children may be entering school or are in kindergarten, results revealed the incidence of obesity from the ages of 5 and 14 was more likely to occur if children entered kindergarten overweight.<sup>30</sup>

#### *Ramifications of childhood obesity*

A high percentage of children who are obese during childhood increase their chances of obesity during later years in life.<sup>29</sup> The increasing prevalence of childhood obesity is associated with the emergence of comorbidities such as an increase incidence of T2DM, hypertension and non-alcoholic fatty liver disease.<sup>29</sup> Other ramifications of childhood obesity include psychosocial and emotional distress by using food to suppress negative emotions. The etiology of obesity is essentially multifactorial and it is vital to provide a multitude of strategies to reduce the incidence of obesity during childhood and adolescence in every level of influence.<sup>29</sup>

#### *Causes of childhood obesity*

Not only do fruit and vegetables provide key vitamins and minerals, but they are also associated with a reduction of chronic diseases such as heart disease and may lower the risk of developing T2DM.<sup>31</sup> Past research has shown there has been a decrease of fruit and vegetable intake among low income children and adolescents. There are numerous

possible causes leading up to childhood obesity. Childhood obesity is the result of interactions on numerous factors relating to the environment, genetics, and socioecological effects such as the child's environment, family, school, and community settings.<sup>29</sup>

### **Home and school environment concerns on child nutrition**

As previously stated, a child's early years are a time period crucial in forming numerous weight-related behaviors. These weight-related behaviors include dietary intake, eating habits, and exercise. During these early years, children go from breastfeeding or formula to a diet consisting of whole foods and learn about food and portions. With this, children learn to develop the foods they enjoy or do not. A child's eating behaviors during preschool years continue to form their eating habits and nutrient intake patterns through adolescence and adulthood, therefore it is important to focus on creating healthy eating in earlier years to prevent the onset of chronic diseases.<sup>32</sup>

#### *Home environment: parents*

Both families and the home environment play a vital role in a child's life.<sup>19</sup> Some of the main factors can include parent's education, size of family, interaction with siblings, and social economic status.<sup>19</sup> A study in Turkey further investigated a maternal influence and the effect of social economic status on fine motor development.<sup>19</sup> Data was collected from more than 2,000 children, where demographic data was gathered using a questionnaire. Results revealed a higher age in mothers, children older than two and higher maternal education were associated with earlier accomplishment of fine motor items. In addition, a higher socioeconomic status was correlated with fine motor skills at



younger ages.<sup>19</sup> Undernutrition and a shortage of food have been dangers among children. Due to these dangers, parental feeding have changed.<sup>1</sup> One of the most important factors that may influence a child's weight are a parent's feeding practices and nutritional intake.

During the first year of life, infants go from consuming one food item, whether breastmilk or formula, to a multitude of foods closer to resembling an adult's diet.<sup>1</sup> This progression allows infants to learn through food based on their experiences and observations.<sup>1</sup> The impact of parental feeding practices can be seen among literature. Parents impact a child's behavior during mealtime in many ways such as choosing the foods for their family, modeling on food choices and patterns, and reinforcement.<sup>1</sup> A parents' feeding practices can be influenced by characteristics found in their child such as their gender, age, weight, eating behavior and even as a response to the child's development and health.<sup>1</sup>

When parents are worried about their child's diet, they may influence what the children eat by trying to limit what and how much as well as pressure their child to eat a healthier diet. This may all lead to unplanned consequences.<sup>1</sup> Restricting a child's access to or the consumption of highly palatable foods can lead to either an increased preferences or over consumption of these foods when available.<sup>1</sup> Parents with controlling feeding practices impact the child by affecting their ability to self-regulate their food consumption which is associated with higher weight gain across childhood.<sup>1,33</sup> On the other hand, an authoritative feeding style, where high demands are placed on eating behavior while being highly responsive to eating cues may promote healthier behaviors during mealtime.<sup>1</sup> The promotion of positive feeding practices such as encouraging the consumption of new foods and healthy eating may help with self-regulation.<sup>33</sup>

Mexican American children have an increased prevalence of obesity compared to Non-Hispanic children. Due to the increased prevalence, it is important to identify any possible risk factors and create interventions to minimize the risks. To evaluate the influence of parental feeding practices on a child's weight, research has looked at Mexican American parents. Participants were parents of Mexican children from the ages 8 to 10, who were either born in the U.S. or Mexico.<sup>33</sup> After two years, results revealed parents who restricted food intake predicted a higher weight in children. As for parents who pressured their child to eat saw no changes in girls, but a decrease in weight among boys. Boys heavier in weight predicted mother's less pressure to eat during the first year and in the second year less controlled behavior with food and greater restriction.<sup>33</sup> As for girls, a heavier weight revealed positive involvement in child's eating and less pressure among fathers. Controlling feeding practices may cause children to focus on outside cues and will impact the child's ability to self-regulate their food intake. Literature has shown restriction of foods will increase a child's weight, while pressure to eat has resulted in a decrease weight. Positive feeding practices such as encouraging new foods and healthy eating may help with self-regulation among a child. Research has shown  $\frac{2}{3}$  of calories come from the home. Accessibility and availability have been strongly associated with an increase of fruits and vegetables even when taste preferences for them were low. In addition, modeling behaviors, family meals, and authoritative feeding practices have shown to promote healthful feeding practices. A high amount of mothers are working, which may lead to children being fed by someone else.<sup>1</sup> In addition to the home environment, children spend a particularly large amount of time in other settings such as school.

### *School Environment: Caregivers*

Within the social ecological model, it is known that parents and early program staff shape children's eating behaviors. Caregivers play an important role in children's eating behaviors, but there is limited research on the caregiver's own feeding behaviors.<sup>34</sup> A study evaluated 85 Rhode Island Head Start teachers' self-feeding behaviors during breakfast and lunch in children using the Environment and Policy Assessment and Observation (EPAO) Self Report. Results indicated there was a higher agreement was seen between reported and observed controlling feeding practices compared to healthful feeding practices.<sup>34</sup> In addition, studies have also assessed the communication between parents and child care staff as well as their perspective of children's feeding practices.<sup>35</sup> Mixed methods were designed to collect and compare data from child care staff and parents of children's eating from the ages of two to five years old. These methods included questionnaires and focus groups. Results indicated there were three meta-themes identified in this study. These include recognition of positive influences of the childcare setting in children's development of healthy eating, concerns about children's eating in childcare and at home, and strategies to improve the communication and transactions relating to the children. Staff in this study expressed they often let parents know the foods their children eat and educate them in child nutrition. Parents expressed they valued the information daily. Some barriers that were expressed was little time and concerns about how a parent may react.<sup>35</sup> In addition, studies have also looked at the association of fruit and vegetable intake with a Head Start teacher's nutrition knowledge and attitudes. Mealtime behaviors were observed and self-reported by Head Start teachers.<sup>36</sup> Among these groups of Head Start teachers, most were non-Hispanic White and had some college

or technical school. Teachers had a high level of nutrition knowledge, attitudes, self-reported mealtime behaviors, and observed mealtime behaviors. There was a positive association between teaching experience with both self-reported and observed mealtime behavior. A teachers meal time behavior was not associated with their nutrition attitudes, knowledge and fruit and vegetable intake, but it was with self-reported mealtime behavior and attitudes.<sup>36</sup> Nutrition attitudes were positively associated with a teacher's self-reported mealtime behavior, findings showed that teacher mealtime behavior was significantly associated with teacher experience.<sup>36</sup> Additionally, there was a study done to assess eating behaviors, nutrition knowledge, and attitudes of Head Start teachers within a Texas location using surveys as well as phone interviews.<sup>37</sup> Most of the participants were minorities, female, and either overweight or obese. Only four teachers answered four of the five nutrition knowledge questions correctly. Approximately half of the teachers expressed how difficult to know what nutrition information to believe and only 9% said they had health nutrition habits. Almost  $\frac{3}{4}$  of teachers reported trying to lose weight and more than 80% said they wanted to weigh less.<sup>37</sup> It is important to provide the proper nutrition education for teachers and the appropriate wellness opportunities to head start teachers to empower them to teach nutrition education to their students and help themselves.<sup>37</sup>

### *Prekindergarten for All*

Overtime within the literature, the development in both education and the economy have been revealed on their effects of high-quality early education and its ability to address barriers within school readiness. There are many policy makers that are turning to prekindergarten as a solution for academic achievement.<sup>2</sup> As of 2010, there are

40 states in which offer a state-funded kindergarten program. The benefits of having children who are three and four practice in high quality prekindergarten can be seen in significantly improving their cognitive development. For example, in children from Tulsa, Oklahoma attending a pre-kindergarten program for all, middle-income children scored more than 40% higher in identification of letter-word and 15% higher in spelling compared to children who did not attend prekindergarten. It is said high-quality prekindergarten is effective in lessening grade repetition.<sup>2</sup> Additionally, high-quality prekindergarten is effective in minimizing the dropping out of school and special education placement which half of all middle-income children either drop out or attend special education. Also, with prekindergarten education it may yield eight dollars for each dollar spent and if more populations are can generate a higher net economic return.<sup>2</sup>

### *Head Start*

In the beginning of 1964, during his State of the Union speech, Lyndon B. Johnson declared the War on Poverty.<sup>38</sup> Head Start was created to break the cycle of poverty by providing a program that will help preschool children's emotional, social, nutritional, mental and physical health needs. In 1995, Early Head Start grants were given serving children from birth to the age of three.<sup>38</sup> An essential component within Head Start is adequate nutrition for pregnant women and children to get the appropriate nutrients to stay active and strong. Head Start provides many resources for managers and staff at Head Start to help promote healthy eating practices within families and provide any additional assistance when needed.<sup>39</sup> In addition, to adequate nutrition, another vital area of focus for Head Start is school readiness. This approach looks at many aspects such as the physical, cognitive, social, and emotional development needed for school

readiness. These programs must create the appropriate goals to reach school readiness for specific ages and development of the children enrolled. The central domains Head Start focuses on include approaches to learning, both social and emotional development, literacy and language, cognition, and perceptual, motor, and physical development.<sup>40</sup>

### **Interventions aiding in child development**

Studies have been done to study the effects of intervention on both gross and fine motor skill performance. To understand the effects of intervention on gross and fine motor skill performance among Hispanic pre-kindergarten children coming from low socioeconomic households, 149 children were randomized into two groups.<sup>5</sup> Children within the treatment group benefited from a planned motor intervention program. Structured lessons from providers with feedback should be used to help develop these important skills.<sup>5</sup> In addition, interventions have been conducted in Head Start centers and preschools. First, researchers determined the performance of children coming from low income households and are at risk. Once their performance was evaluated, researchers wanted to evaluate the impact of a program known as Food Friends Get Movin' with Mighty Moves (MM) on improving fine motor skills at this population after a two year follow up.<sup>41</sup> At baseline, all participants were much lower in balance and object control skills than the normative sample. At the post follow up at first grade, all participants were below normative sample in balance, but only the control group was lower in object control skills. Researchers state at risk preschoolers are already behind in fundamental movement development and it will only continue through first grade.<sup>41</sup>

### *Child and Adult Care Food Program (CACFP)*

The Child and Adult Care Food Program (CACFP) improves the quality of daycare by making it more affordable for families of low socioeconomic status and providing balanced meals and snacks. In addition, the CACFP is administered through grants by the USDA's Food and Nutrition Service. The locations in which offer meals and snacks through the CACFP plays a distinct role in supporting the growth, development, and overall health in children and other populations. There is an opportunity in childcare providers to implement healthy eating habits in young children. The nutrition standards in the meals and snacks served by the CACFP are based off the Dietary Guidelines for Americans (DGA) which implies there are a variety of fruits and vegetables, more whole grains, as well as less sugar added to foods and saturated fat.

Through the CACFP, there are different meal patterns for infants and children. Meal patterns for infants during breakfast, lunch, and dinner indicate breast milk or formula must be served. In addition, infant formula and dry infant formula should be iron fortified due to the infant's depletion of iron storage around four to six months. Yogurt should not have more than 23 grams of sugar as well as fruit and vegetable juices should not be offered.<sup>42</sup> As for children, their meal pattern under the CACFP includes a separate fruit and vegetable component rather than combining and juice is limited to once per day. As for whole grains, at least one serving should be whole grain enriched, where desserts with grains do not count. In addition, meat and meat alternatives can be served in place of the entire grains' component within breakfast, at most three times per week. Yogurt should not have more than 23 grams of sugars per six ounces and cereals for breakfast should not have more than six grams of sugar per dry ounce. Unflavored milk for

children five years and older and non-dairy milk alternatives can be in place of milk if nutritionally equivalent to milk. Lastly, frying is not allowed on-site to prepare foods.<sup>43</sup> This thesis project, used the Social Cognitive Theory (SCT) and the Social Ecological Model (SEM) as the theories in developing items.

## **Theories**

### *Social Cognitive Theory (SCT)*

Additionally, to further understand the influences of personal and environmental factors and human behavior on each other using the SCT. Within the SCT, there are three main factors that affect the chances of a person changing a health behavior. These three main factors include goals, self-efficacy, and the expectancies of outcomes. An individual with self-efficacy will be able to change behaviors even when facing challenges. If they feel like they cannot control their behavior, the individual will not be motivated. When an individual adopts new behaviors, the individual and environment will change. The SCT involves numerous constructs from models of cognitive, behavior, and emotional of behavior change. These constructs include reciprocal determinism which is the interaction of the individual, behavior, and environment where the behavior is done.<sup>44</sup> Next, behavioral capability which is the knowledge and skill to do the behavior, expectations which are the outcomes for the behavior, and self-efficacy which is the confidence in the individual's ability to take action and overcome any challenges they may face. Next, observational learning (modeling) which is the behavioral acquisition that happens when watching the actions and outcomes of other's behaviors. There will be



different potential strategies used based on the concept.<sup>44</sup> To understand the influences on multiple levels in detail, the social ecological model was used.

### *Social Ecological Model (SEM)*

Using the social ecological model (SEM), these factors can be described as influences on unhealthful eating habits in children. The model below, Figure 1, reveals the four levels of influences. These levels of influence include intrapersonal factors such as individual behaviors, interpersonal such as the family and peers, physical environments such as various settings such as the home, school, and childcare centers and lastly, macro-level environments such as policies and health care systems. Each level, or accompanied by more than one, are believed to influence what a child consumes.<sup>45,46</sup> It is vital to take into consideration the various influences of unhealthy feeding habits among children using the SEM.

The intrapersonal or individual level of the SEM examines personal factors relating to behavior during intake and food choices such as behaviors, attitudes, preferences, knowledge, values as well as biological and demographic factors. These individual factors are influenced by motivations, self-efficacy, behavioral capability, and outcome expectations.<sup>45</sup>

Next, interpersonal factors in the social environment, relates to factors that influence eating behaviors such as networks including family, friends, peers and others in the community that may impact the food choices by role modeling, social norms, and social support. Children's eating behaviors and the increase risk of childhood obesity have been shown to be associated with parent feeding styles.<sup>45-49</sup> These activities include role modeling, social support, and social norms within the environment.

The physical environment, also known as the microsystem level, includes settings where eating behaviors occur such as the working site, home, restaurants, and schools.<sup>46</sup> Within this level, the design of relationships, activities, and social roles by the individual within the intrapersonal level which can invite, allow, or stop the possibility of engagement such as the through accessibility, availability, barriers, and opportunities.<sup>45,46</sup> For example, within San Marcos Texas, according to the United States census, the median household income as of 2017 is \$34,748. Of the total population in San Marcos, there are 34.7% living in poverty.<sup>4</sup> This difficulty may affect the accessibility of healthy foods. Lastly, there has been a lot of research in schools, but not so much in childcare settings. Researchers believe this is an area of opportunity due to more than half of the children under the age of five spend an average of 29 hours a week in childcare settings. It is believed stronger nutrition requirements for child care providers and requirements for healthier foods can improve the environment.<sup>45</sup> Schools can have a large impact on what a child eats because children can consume two meals and a snack within the following setting. An increase in classroom education to complement the changes in the school environment so children can improve their skills to have a healthier lifestyle.<sup>45</sup> In addition, the processes between two specific settings such as the home and the school in known as the mesosystem.<sup>46</sup> Whereas the exosystem would include linkages within more than two settings.<sup>46</sup>

Lastly, the final level known as macro-level environments which include the values and norms, marketing industry, policy, and programs. The macrosystem includes the micro, meso, and exosystems, all levels previously mentioned.<sup>45,46</sup> Many factors in the SEM may influence a child's weight through their environments. However,

the preschool and home setting can both play an important role in promoting healthy feeding practices during the first years of life which is vital for their growth and development. As a result, introducing the appropriate early childhood feeding practices at the preschool and home is important for a child's overall development.

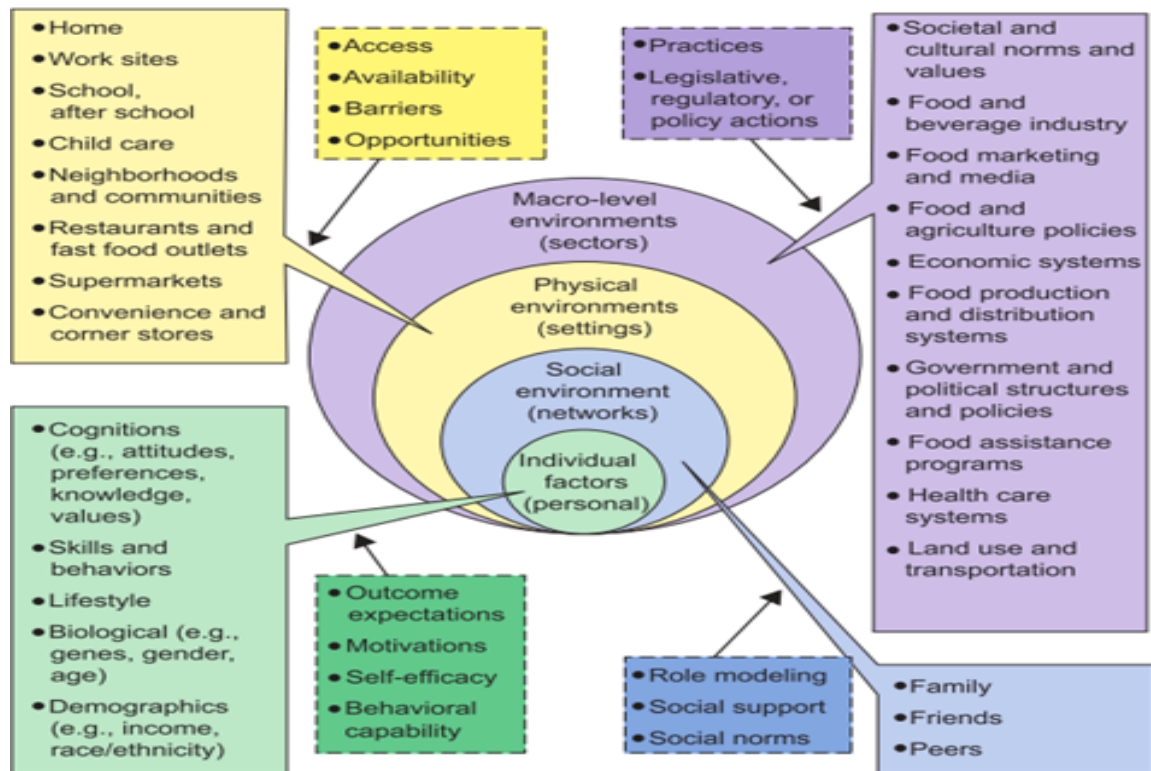


Figure 1. Ecological framework and the multiple influences on a child's nutrition.<sup>45</sup>

## Objectives

### *Purpose of Study*

This study aims to expand upon the silos empirical evidence on early childhood feeding practices and fine motor development as well as to explore an interconversion of using early childhood feeding practices to enhance fine motor skills through the preschool and home environments. The purpose of this study aims to launch a descriptive research design with the following objectives:

### *Research Questions and Objectives*

**Research Question 1.** Is implementing lesson modules using early childhood feeding practices and fine motor skills with Head Start teachers for six weeks an effective approach within the classroom setting?

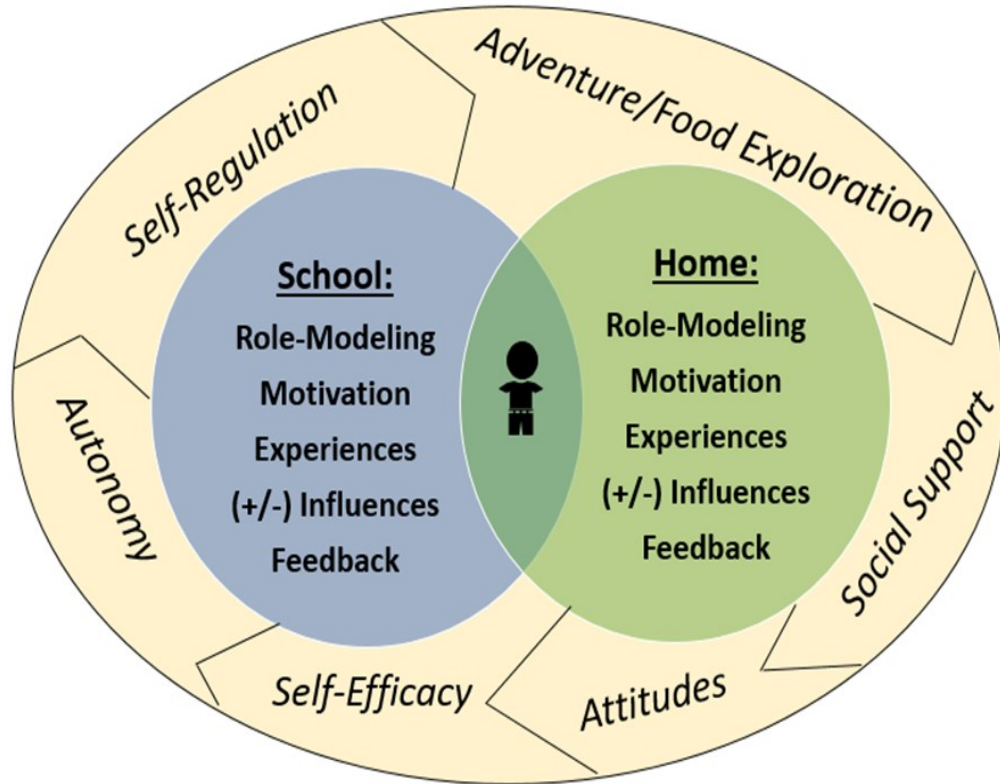
**Objective 1.** Implementing lesson modules involving a different fine motor mealtime task may increase the capacity to address fine motor skills and nutrition, decrease burden, and empower teachers and students.

**Research Question 2.** What are Head Start family's perspective on the educational materials as tools to improve fine motor development, nutrition, and school readiness during mealtime?

**Objective 2.** Facilitating lessons through:

2. Corresponding weekly prompts to practice fine motor mealtime tasks through the collection of pictures and text messages will aid in the exploration of mealtime dynamics in the home food environment. In addition, Head Start families may overall enjoy the bilingual materials and find the information provided as applicable

and easy to understand. As for their children, this may increase self-regulation, self-independence, and autonomy. Figure 2 is a conceptual model created by the researchers used to assess these understandings.



**Figure 2. Conceptual model addressing the built environment and child.**

### **III. METHODS**

#### **Institutional Review Board**

This project has a memorandum of understanding (MoU) between Community Action, Inc. (Head Start) and Texas State University. In addition, this thesis project is approved by Institutional Review Board #6230 at Texas State University.

#### **Classroom Component**

##### *Teacher Surveys*

After receiving permission from Head Start administrators, two researchers visited each center for one to two hours explaining the purpose of the study and what is needed from teachers if they choose to participate. Teachers who provided consent completed this survey during naptime and took no longer than 15 minutes (n=19).

A survey was designed to collect questions about teacher's demographics such as age, race/ethnicity, gender, marital status, primary language spoken in the household, highest level of education, and if they considered themselves parents. Additionally, questions on the survey included their current job title, employment status, duration of working with children, the age group they teach, duration of mealtime, and a check all that apply question when assessing any barriers they or their students experience during mealtime. These questions were included in order to understand the teachers' role in the classroom setting.

### *Classroom Mealtime Observations*

In hopes of understanding the classroom environment during mealtime more thoroughly, participants included all 10 classrooms from both A. Washington and Henry Bush to be observed during mealtime.

Two trained researchers were present to observe breakfast or lunch in every classroom from both centers using an observational checklist as the qualitative assessment method. The observational checklist was developed as an adaptation from previous assessment tools such as the Go Nutrition and Physical Activity Self-Assessment for Child Care (NAP SACC) Self-Assessment for child nutrition. Questions in the observational checklist included the portioning of meals and teacher's behaviors at mealtime such as talking about the benefits of foods, using positive language and whether teachers sat down with their students during mealtime. Additional field notes were taken by both researchers. On separate occasions, researchers arrived at breakfast or lunch time in each classroom 10 to 15 minutes before in order to get children accustomed to having both researchers present during mealtime. Researchers sat at different ends, on opposite sides, of the table during mealtime. If the classroom had two tables, which was common in the Head Start with three to four-year old's, one researcher sat at one table and the other researcher at the second table.

The NAP SACC program has worked for over 10 years with other education and early care programs. The tasks of NAP SACC and these other programs is to help direct preschool children on a lifelong path to healthy eating patterns and physical activity.<sup>48</sup> The NAP SACC program has developed self-assessment, action planning and tools for education programs set goals and make improvements to their nutrition and physical

activity practices.<sup>48</sup> These self-assessment tools include breastfeeding and infant feeding as well as child nutrition. A pilot intervention has been created to see what a nutrition and physical activity environmental intervention in childcare is able to do. Within the childcare centers undergoing an intervention and completing the self-assessment tool at baseline showed the most improvements in environmental nutrition and physical activity. In addition, directors from the child care centers reported the self-assessment instrument was either very easy to use (64%) or fairly easy to use (36%).<sup>48</sup>

### **Teacher Qualitative Interviews**

To understand the barriers, beliefs, knowledge and experiences of early childhood feeding practices and fine motor skills during mealtime at the preschool and home setting, interviews occurred for teachers at A. Washington and Henry Bush. At least one teacher per classroom was interviewed, 11 teachers were interviewed.

In order to continue to understand how a child's fine motors skills in mealtime can be influenced by both the home and school environments, teacher's perspectives were further explored. Two researchers conducted semi structured interviews with teachers (n=11) using a semi structured interview guide that asked open ended questions on their knowledge on fine motor skills and early childhood feeding practices importance and how it is addressed during mealtime in their classroom.<sup>49,50</sup> Furthermore, open-ended questions were asked to understand the perceptions of the home environment through what the teachers witness in the classroom. These domains included their perceptions on what the home may be practicing that is inhibiting their students' autonomy as well as the interaction environment between parents and teachers. Based on availability of space, interviews were done in person either in the classroom or common area of center during



naptime.<sup>45,49,50</sup> All interviews ranged from 20 to 40 minutes and were recorded. Data analysis included transcribing and themating using a three-coder model.

Within the Social Ecological Model (SEM), it is known parents and early program staff shape children's eating behaviors.<sup>35,46,49,50</sup> The SEM has been used to explore communication between parents and childcare staff as well as exploring their perspective of children's feeding practices. Using the SEM to develop questions has identified three meta-themes. These include recognition of positive influences of the childcare setting in children's development of healthy eating, concerns about children's eating in childcare and at home, and strategies to improve the communication and transactions relating to the children. Staff in this study expressed they often let parents know the foods their children eat and educate them in child nutrition. Parents expressed they valued the information daily. Some barriers that were expressed was little time and concerns about how a parent may react.<sup>35,46</sup>

### **Mealtime lesson modules development, implementation, and evaluation**

Researchers created lesson modules consisting of six fine motor mealtime tasks performed weekly at home and the preschool environment. These fine motor mealtime practices involve early childhood feeding practices such as using a cup instead of a 'sippy' cup to transition from nursing to drinking water and eating healthful foods with a spoon and fork instead of only using hands. The outline of the six lesson mealtime tasks and their objectives can be found in Table 1. Alongside these mealtime tasks, general guidelines were created based on the classroom mealtime practices researchers observed were not as robust. The guidelines developed included practicing fine motor mealtime task three times a week at either breakfast or lunch, talking about the benefits of foods at

mealtime, allowing children to either serve all or most foods and beverages during mealtime based on if they were in the Early Head Start or Head Start center, unless foods pose a danger, guiding children when they are serving themselves only if they are having trouble, encouraging children to try foods at least once, and having water on the table as well as offering it during mealtime. These guidelines were created for the 10 classrooms participating in this study. Six classrooms were Early Head Start classrooms and four were Head Start classrooms.

The fine motor mealtime tasks were developed based on Head Start's Approach to School Readiness and undeveloped child skills mentioned by teachers' during the interview process. Head Start's Approach to School Readiness includes many aspects of child development such as the physical, cognitive, social, and emotional development needed for school readiness. The central domains Head Start focuses on include approaches to learning, both social and emotional development, literacy and language, cognition, and perceptual, motor, and physical development. The fine motor mealtime lesson modules focused on the perception, gross motor, fine motor, and health, safety, and nutrition central domains. The fine motor area in the infant/toddler and preschooler domains will be used for development of lesson modules.<sup>49</sup>

<b>Table 1. Six-week lesson modules practiced at the home and school environment</b>		
<b>Week</b>	<b>Feeding Practice</b>	<b>Objectives</b>
1	Pincer grasp	Increase hand strength and manipulation of objects and tools.
2	Using a spoon to scoop sticky/liquid foods	Increase hand and eye coordination, grasp of utensil and hand strength.
3	Using a fork to stab foods	Increase hand and eye coordination, grasp of utensil and hand strength.
4	Peeling foods	Increase hand and finger strength and bilateral coordination.
5	Spreading foods	Increase wrist movement and precision and control.
6	Pouring water	Increase bilateral coordination and hand and eye coordination.

### **Home Component**

Guardians received an educational handout aligning with the mealtime lesson practiced in the preschool setting. Additionally, guardians provided a picture of their child practicing the fine motor mealtime task aligning with the classroom weekly for six weeks using the photo-texting method.

#### *Photo Texting and educational materials for guardians*

Previously, a study was done using photo-texting as a self-assessment technique to gather a participant's home food environment. The photo-assignment was developed to communicate what is expected from the activities or areas of a participant's food environment. Within six photo-assignments, researchers revealed four themes which included knowledge of healthy foods and practices, mealtime routines, food practices as well as accessibility and availability of foods.<sup>50</sup>

## **Home and Classroom Component**

### *Post-activity Evaluations*

Initially, 19 teachers who participated in the post-activity evaluations and 18 guardians. At the end of the project, 18 teachers completed all post-activity evaluations, one teacher missing one week due to sickness. As for parents, 12 turned in all photos and post-activity evaluation forms.

Lastly, post-activity evaluations were completed by teachers and guardians to assess their experiences practicing the fine motor activities and any future changes that should be made in further lesson plans involving mealtime within both centers.

### **Fidelity Check through Post-Activity Evaluations**

Fidelity checks were completed through the post-activity evaluations for every participant in the classroom and home setting. Each teacher or guardian who consented to participate in the study completed the fidelity check through the weekly post-activity evaluation forms.

The fidelity check was done to see how often teachers and guardians practiced the mealtime task proposed by researchers and if they did not, participants were asked what barriers they faced. Fidelity criteria has been used as a guidance on implementing models of programs as planned or to monitor programs to help with the quality.<sup>51</sup> In addition, including fidelity criteria aids in promoting the proper documentation and guidelines to be used in future studies. The first step is establishing the fidelity criteria which includes the intensity, specification of length, and duration of service.<sup>51</sup> In addition, this includes the content, procedures, activities over the length of the service, roles, qualifications and

the activities of staff as well as inclusion and exclusion characteristics of the population. The development of fidelity criteria includes three methods which are using a specific model with efficacy, gather expert opinions or based off a literature review, and qualitative research.<sup>51</sup> The second step is the measurement of fidelity which can be quantified by ratings of experts based on documentation or records, interviews, site observations, videotaped sessions, or surveys and interviews.<sup>46,49,50</sup> Lastly, the final step including assessing the reliability and validity of fidelity criteria.<sup>51</sup> Data collection involved a checklist form within the post activity evaluations every week to validate the duration and frequency of practicing the lesson modules. Strengths of this research method include providing a simple method to collect participants' practices as well as identifying the potential barriers of implementation.

### **Data Analysis**

After collecting all data, participant responses were entered into Microsoft Excel, identifiers were omitted, and data was cleaned and checked for accuracy by researchers. Descriptive statistics were generated to gather survey data of Head Start teacher participants including demographics and biggest barriers during mealtime in the classroom. Frequencies were done to collect demographics, duration working with children, if teachers identify as a parent, and the biggest barriers experienced during mealtime within their classroom.

Next, teacher interviews were audio recorded and transcribed. The interviews conducted in Spanish were transcribed, translated to English and checked for accuracy by researcher. If any, identifiers were omitted. Interviews were then coded for conceptual themes such as self-efficacy among teachers' and students, the perceptions of the

environment, and experiences among teachers. Quotes were extracted to determine the inter-rater reliability using two coders with an impartial reconciler if agreement was not met. The inter-coder reliability was 85.5%.

Comment codes from observational checklist, field notes, and teacher and guardian's post-activity evaluations were collected and clustered based on potential domains. Comment codes were developed to explore teacher and guardian perspectives of lessons as well as evaluating if using mealtime was an effective avenue for fine motor development. A two-coder system was used. Lead data collector was the primary coder and assistant data collector was the secondary coder. If there was a discrepancy, primary coder made the final decision. Reliability score was 87.7%. Likert-scale categorical variables were analyzed via the chi square for goodness of fit.

## **IV. MANUSCRIPT**

### **Article Title**

Preschool Nutrition Education During Mealtime and Fine Motor Development

Assessment: A Caminitos Collaborative Study

### **Introduction**

Early childhood nutrition and kindergarten readiness are pillars of child development which shed influence on child and adult success.<sup>1,2</sup> Before a child uses fine motor skills to write, they use their hands to explore food during mealtime. Factors including food insecurity, low socioeconomic status, and obesity are problems affecting numerous populations around the world.<sup>3,4,5</sup> In the United States, the prevalence of obesity is increasing among Hispanic and Non-Hispanic Black children and adolescents.<sup>3</sup> Alongside food insecurity and low socioeconomic status, the purchasing of foods that may possibly display protective benefits against metabolic syndromes may be more difficult to purchase among these families.<sup>3</sup> In addition to the health concerns obesity displays on a child's development, previous research has revealed that children at an unhealthy weight status and living in low socioeconomic households may depict a diminishment in motor skills performance.<sup>5,6</sup> It is important to allow a child to explore foods in order to increase their independence and understand the importance of self-regulation.<sup>26</sup> To combat poverty, programs such as Head Start were developed to assist families. An essential component within Head Start is adequate nutrition for families and children to receive the appropriate nutrients to stay active and strong. In addition to adequate nutrition, another vital area of focus for Head Start is school readiness. The

Head Start Approach to School Readiness looks at many aspects such as the physical, cognitive, social, and emotional development needed for school readiness.<sup>40</sup>

Past research has developed planned interventions to understand the effects of gross and fine motor skill performance among Hispanic pre-kindergarten children living in low socioeconomic households. A study randomized 149 children into two groups, one group received skills-based instruction and the other did not.<sup>5</sup> Children within the treatment group benefited from a planned motor intervention program.<sup>5</sup> Currently, to our knowledge, there is a lack of literature on early childhood feeding practices with structured fine motor education to promote kindergarten readiness. To address this knowledge gap, the focus of this research study was to use qualitative and quantitative data through surveys, observations, interviews and post-lesson evaluations conducted with teachers to explore (1) the classroom mealtime facilitators and barriers and (2) their knowledge, perception of home practices, and their interaction with guardians. As for guardians, the objective was to use qualitative and quantitative data from educational handouts and post lesson evaluation forms to (1) aid in informing families on the importance of fine motor skills during mealtime, tips and recipes for the families and (2) assess their feasibility of practicing with their children.

## **Methods**

A mixed method approach was utilized to evaluate the feasibility of a six-week lesson plan in Head Start centers among teachers, families, and students. Qualitative and quantitative data were gathered to understand the practicality of using feeding practices to address fine motor skills during mealtime within homes and centers. The Social



Cognitive Theory (SCT) and Social Ecological Model (SEM) were used to develop teacher surveys and interviews. Mixed methods were used to gather qualitative and quantitative data on the feasibility of using feeding practices to promote fine motor skills during mealtime. All observational data and weekly lesson evaluations were measured and analyzed. Teacher and guardian input were collected to reveal the overall feasibility of lessons among the home and classroom.

### *Theory*

In order to further understand the multiple levels of influences on a child's fine motor skills and mealtime behavior, researchers used all influences of the Social Cognitive Theory (SCT) and Social Ecological Model (SEM) to develop surveys and interviews throughout this project. The SCT and SEM were used to create themes from interviews with Head Start teachers. Themes from these theories were used to demonstrate teacher's knowledge, self-efficacy, experiences, and interactions with guardians and students. Many factors in the SCT and SEM may influence a child's behaviors through the environment. However, the preschool and home setting can both play a vital role in promoting healthy feeding practices during the first years of life where growth and development is vital. As a result, introducing the appropriate early childhood feeding practices in the preschool and home is important for a child's overall development.

### **Participants and Recruitment**

The researchers implemented a mixed method approach for this exploratory study to gather classroom and home mealtime dynamics. Due to the importance of Head Start

services for low-income families, researchers selected two Community Action Inc. Head Start centers residing in San Marcos, Texas to participate. Centers were recruited if they met the study inclusion criteria of serving low-income children of  $\leq 5$  years of age. Center administrators, site supervisors, and parent councils were explained the importance of early childhood feeding practices and fine motor skills, as well as how the study would develop a six-week lesson plan for the classroom and home to help with fine motor skills in children. This project has a memorandum of understanding (MoU) between Community Action, Inc. (Head Start) and Texas State University. In addition, this project was approved by Institutional Review Board #6230 at Texas State University.

After IRB approval, researchers arrived at Head Start centers and explained the purpose of the study to teachers such as the completion of surveys and interviews, classroom mealtime observations, and the six-week mealtime lesson plan expectations. Eligibility criteria for the study participation by Head Start teachers included being over 18 years of age and either a Head Start or Early Head Start teacher. Recruiters explained that the interview would be recorded to gather all valuable information, would be de-identified, and would not be shared with any outside sources. All recruitment was done in-person and sampling size goal for teachers was at least 10.

For Head Start families, participants were recruited on-site during drop-off and pick-up for two weeks due to efficiency. Researchers recruited 25 guardians in order to have a sampling size of at least 10 guardians by the end, due to expectations of some families dropping out throughout the semester of school. During recruitment, guardians were explained the importance of fine motor skills and early childhood feeding practices as it may pertain to school readiness and independence in children. In addition, guardians

were explained how they would be required to send a photo of their child practicing the given mealtime task weekly and completion of the evaluation form at the end of every week. Recruiters disclosed how pictures would be used for research purposes only and if needed, the child's face would be covered. All participants were given a Best Food FITS t-shirt for participation.

## **Measures and Procedures**

### *Classroom Component*

Teacher surveys.

A survey was designed to collect questions about teacher's demographics such as age, race/ethnicity, gender, marital status, primary language spoken in the household, highest level of education, and if they have children. In addition to demographics, questions on the survey included questions understanding the teacher's role in the preschool setting. These questions include their current job title, employment status, duration of working with children, the age group they teach, duration of mealtime, and any barriers they or their students may experience during mealtime. After receiving permission from Head Start administrators, two researchers visited each center for 1 to 2 hours explaining the purpose of the study and what was needed from teachers' if they decided to participate. Teachers' who gave consent completed the survey during naptime and took no longer than 15 minutes (n=19).

Mealtime classroom observations.

In order to understand the classroom environment during mealtime more thoroughly, two researchers were present at a time to observe breakfast or lunch in every

classroom from both centers using an observational checklist as the method for a qualitative assessment. The main researcher took two qualitative research classes and trained the other two researchers. The observational checklist was created based off the Go NAPSACC Self-Assessments- Centers, School-based and Head Start.<sup>40,48</sup> For over 10 years, the NAPSACC program has worked with other education and early care programs to help direct preschool children on a lifelong path to healthy eating patterns and physical activity. The NAPSACC program has developed a self-assessment, action plan, and tools for education programs to set goals and make improvements to their nutrition and physical activity practices through breastfeeding, infant feeding, and child nutrition. A pilot intervention in childcare centers, revealed centers undergoing an intervention and completing the self-assessment tool at baseline showed the most improvements in environmental nutrition and physical activity.<sup>48</sup>

The domain of focus was the child nutrition portion. Within this domain, researchers created an observation checklist using the feeding environment section in childcare settings.<sup>47</sup> Questions in observational checklist included the portioning of meals and teacher's behaviors at mealtime such as talking about the benefits of foods, using positive language, and whether teachers are sitting down with students during mealtime. Additional observations were taken by both researchers in the additional comments section of the observations form. Researchers arrived at breakfast or lunch time in each classroom 10 minutes before in order to get children accustomed to having both researchers present during mealtime. Researchers sat on opposite sides of the table and if the classroom had two tables, one researcher sat at one table and the other researcher at the second table.

Teacher qualitative interviews.

Two researchers conducted teacher interviews (n=11) using a semi structured interview guide that asked open ended questions on their knowledge on fine motor skills, early childhood feeding practices, and how it is addressed during mealtime in their classroom.<sup>48,49</sup> The SCT and SEM were used to develop interview questions and were modified based on teacher's knowledge, self-efficacy, experiences and interactions with guardians and students. Furthermore, open ended questions were asked to understand the perceptions of the home environment through what the teachers witness in the classroom. These domains included their perceptions on what the home may be practicing that is inhibiting their students' autonomy as well as the interaction between guardians and teachers. Based on availability of space, interviews were done either in classroom during naptime or the common area of center.<sup>48,49</sup> Teachers' who felt more comfortable speaking Spanish were interviewed in Spanish. The original semi-structured interview guide in English was translated to Spanish and back to English for accuracy. All interviews ranged from 20 to 40 minutes and were recorded. Data analysis included transcribing and themating using the SCT and SEM. Interview responses were coded and themated using the three-coder model to test for inter-rater reliability- percentage agreement at least 80%.<sup>48</sup> Inter-coder reliability was 86.4%.

Mealtime lesson modules development, implementation, and evaluation.

Lesson modules consisted of six fine motor mealtime tasks, one task each week, for six weeks to be practiced both at the preschool and home environment. These fine motor mealtime practices involved early childhood feeding practices such as using a cup instead of a 'sippy' cup to transition from nursing to drinking water and eating healthful

foods with a spoon and fork instead of only using their hands. The six mealtime tasks are as follows: pincer grasp, using a spoon, using a fork, peeling foods with fingers and hands, spreading foods, and pouring. The six mealtime practices were developed based on mealtime observations, teachers' interview responses, and Head Start Approach to School Readiness.<sup>40</sup> This approach includes many aspects of child development such as the physical, cognitive, social, and emotional development needed for school readiness.<sup>40</sup> For the development of the mealtime lesson modules, this study focused on the infant/toddler and preschooler domains within the fine motor area. Additionally, guidelines were created to validate if teachers practiced tasks. The guidelines proposed to teachers every week included practicing the fine motor mealtime task three times at either breakfast or lunch, explaining benefits of food during mealtime, allowing children to serve most or all foods by themselves based on age group, guiding children only when they are struggling, encouraging the consumption of foods at least once, and always offering water during mealtime. These guidelines and lesson modules were given to each classroom in both centers; a total of 10 classrooms. At the end of the week, each teacher completed a post-activity evaluation form as a form of a fidelity check, as well as feasibility of mealtime task every week. Researchers collected the forms at the end of every week or the beginning of the following week during naptime.

### *Home component*

Photo texting and educational materials for guardians.

In order to align the classroom and home environment, guardians received an educational handout every week for six weeks at the beginning of the week by teachers.

In addition, researchers sent a text to guardians explaining what educational handout they were receiving and what mealtime task to practice with their child at home. Guardians provided a picture of their child practicing each fine motor mealtime task for six weeks and filled out a post-activity evaluation based on the information they learned through the handout. Reminder texts were sent to guardians to complete task materials if needed. Previously, a study was done using photo-texting as a self-assessment technique to gather a participant's home food environment.<sup>50</sup> The photo-assignment was developed in this study to communicate what is expected from the activities or areas of a participant's food environment. Within eight photo-assignments, researchers revealed four themes which included knowledge of healthy foods and practices, mealtime routines, food practices as well as accessibility, and availability of food.

#### *Home and Classroom component*

Post-activity evaluations.

Initially, 19 teachers and 13 guardians participated in the post-activity evaluations. At the end of the project, 18 teachers completed all post-activity evaluations; one teacher missed one week due to being sick. A total of 13 guardians turned in all photos and post-activity evaluation forms.

In order to assess whether guardians and teachers practiced the guidelines and fine motor mealtime tasks as proposed by researchers, participants were asked to complete post-activity evaluations at the end of every week. Lastly, post-activity evaluations were completed by teachers and guardians to assess their experience practicing the fine motor activities and any future changes that should be made in further lesson plans.

Fidelity check-through post-activity evaluations.

Fidelity checks were completed through the post-activity evaluations for every participant in the classroom and home setting. Each teacher and guardian who consented to participate in the study completed the fidelity check through the weekly post-activity evaluation forms.

The fidelity check was done to see if teachers and guardians practiced the mealtime tasks proposed by researchers; three times a week at school with teachers and once a week at home with guardians. If they did not practice the tasks, then participants were asked to identify barriers they faced. Fidelity criteria has been used as a guidance on implementing models of programs or to monitor programs to help with the quality.<sup>50</sup> In addition, including fidelity criteria aids in promoting the proper documentation and guidelines to be used in future studies. Data collection involved a checklist form within the post activity evaluations every week to validate the duration and frequency of practicing the lesson modules.

### **Data Analysis**

After collecting all data, participant responses were entered into Microsoft Excel, identifiers were omitted, and data was cleaned and checked for accuracy by researchers. Descriptive statistics were generated to gather survey data of Head Start teacher participants including demographics and biggest barriers during mealtime in the classroom. Frequencies were done to collect demographics, duration working with children, if teachers identify as a parent, and the biggest barriers experienced during mealtime within their classroom.



Next, teacher interviews were audio recorded and transcribed. The interviews conducted in Spanish were transcribed, translated to English and checked for accuracy by researcher. If any, identifiers were omitted. Interviews were then coded for conceptual themes such as self-efficacy among teachers' and students, the perceptions of the environment, and experiences among teachers. Quotes were extracted to determine the inter-rater reliability using two coders with an impartial reconciler if agreement was not met. The inter-coder reliability was 86.4%.

Comment codes from observational checklist, field notes, and teacher and guardian's post-activity evaluations were collected and clustered based on potential domains. Comment codes were developed to explore teacher and guardian perspectives of lessons as well as evaluating if using mealtime was an effective avenue for fine motor development. A two-coder system was used. Lead data collector was the primary coder and assistant data collector was the secondary coder. If there was a discrepancy, primary coder made the final decision. Reliability score was 87.7%. Likert-scale categorical variables were analyzed via the chi square for goodness of fit.

## **Results**

### *Teacher Survey Results*

The teacher survey results are found in Table 2. Table 2 shows the demographics of the teachers who participated. In addition to demographics, teachers were also asked to report the biggest barriers experienced during mealtime in their classroom. The biggest mealtime barriers reported amongst teachers include that students are hesitant to try foods at least once during mealtime 24.4% (n=11), there is not enough food to satisfy

hunger of all students within my classroom 15.6% (n=7), and student mealtime behavior causes disruption 15.6% (n=7).

<b>Table 2. Teacher survey data.</b>		
	<b>Teachers (N=19)</b>	
<b>Participant</b>	<b>n</b>	<b>(%)</b>
Female	19	(100)
<b>Race/Ethnicity</b>		
Non-Hispanic Black	1	(5.3)
Non-Hispanic White	5	(26.3)
Hispanic or Latina	11	(57.9)
Asian	2	(10.5)
<b>Age (years)</b>		
18-24	2	(10.5)
25-34	5	(26.3)
35-44	5	(26.3)
45+	7	(36.8)
<b>Education Level</b>		
Some high school, no diploma	1	(5.3)
High school graduate, diploma or the equivalent (ex: GED)	4	(21.1)
Associate degree/certificate	4	(21.1)
Bachelor's degree	9	(47.4)
Graduate degree	1	(5.3)
<b>Identify as a Parent</b>		
Yes	15	(78.9)
No	4	(21.1)
<b>Duration Working with Children</b>		
0-1 year	1	(5.3)
2-3 years	3	(15.8)
3-4 years	3	(15.8)
4-5 years	4	(21.1)
6-7 years	1	(5.3)
More than 10 years	7	(36.8)

### *Pre-Intervention Teacher Interview Findings*

During the interviews, teachers indicated they had prior knowledge on the importance of fine motor skills and how they are addressed within the classroom and during mealtime. Additionally, teachers revealed they understood how fine motor skills impact school readiness such as holding a pencil and turning pages of a book. Table 3 describes teacher interview quotes regarding three constructs and two emergent themes within the SCT and SEM theories. Themes were organized within three major constructs social support, self-efficacy, and resilience. The emergent themes include reteaching after holiday break and guardians not showing any concerns on school readiness.

<b>Table 3. Constructs and themes in teacher interviews (n=11).</b>			
<b>Constructs</b>	<b>Theme</b>	<b>Description</b>	<b>Quotes</b>
<b>Social Support</b>	Lack of exposure to foods	Teachers can tell when a child has not been exposed to various foods based on their interest in foods served at HS.	"Sometimes it takes [children] awhile to warm up to foods because they may not be eating that at home" (i2)
	Family-style eating	This style of eating required by HS positive influence on students.	"... and that is why we do family style [meals] because it puts us to teach how and what [to eat]." (i11)
	Verbal communication importance with guardians	The importance of interaction between teachers and guardians.	"I mean constantly talking with [guardians], encouraging what we do here so it is not just one-sided." (i7)
<b>Teacher's self-efficacy</b>	Role-modeling importance at mealtime	Teachers using role-modeling to promote healthy eating behaviors.	"Also, emphasize like I am using my spoon to eat my cereal, I am using my fork to eat my spaghetti, look I got one and you got one." (i4)
	Teachers emphasize the importance of exploration in children	Teachers explain how exploration is important in healthful feeding behaviors.	"... [using utensils is] a process, they are not just going to you know, know how to use a spoon. Like learn how to balance the spoon and how to hold it..." (i2)

<b>Table 3 continued. Constructs and themes in teacher interviews (n=11).</b>			
<b>Teacher's self-efficacy</b>	Trying foods at least once	Teachers encourage children to take at least one bite foods served at HS.	"Sometimes they will go ewe ewe, I don't like that, and I say try it, take a thank you bite try it, do a thank you bite and see if you like it." (i3)
<b>Resilience</b>	Importance of communication during mealtime	Teachers talk to children about numerous topics during mealtime in HS.	"We always try to talk about the food, like what color is your food, what does it taste like, do you have this at home before, try to talk about the foods and try to get them interested in it.." (i4)
	Teachers giving ideas to guardians to help child	Teachers recommend different suggestions and ways to guardians.	"One mom, I told her about squeezing a sponge, because her child needed to work on fine motor." (i2)
	Teachers helping guardians with child's mealtime behaviors, but not being forceful and intrusive	Teachers suggest to guardians' ways they can help their child and try not to overstep.	"Give [guardians] this input or put it on the form. It depends on the [guardians]. No one likes to be told to not do this." (i1)
<b>Emergent Themes</b>	Reteach after holiday breaks	Teachers reteach and remind children to use their utensils after long breaks from school due to the lack of practice at home.	"Oh yes, a lot. Since after Christmas they arrive in the same way from the beginning, everything is lost, because there is no consistency." (i10)
	No concerns about school readiness	Guardians do not express concern about their children in fine motor and school readiness.	"No... I have never had a parent ask me my concerns." (i8)

### *Guardians Demographics*

In consultation with Head Start, in order to obtain permission to engage in this project, we agreed upon not collecting any invasive information of guardians.

Characteristics gathered include gender and preferred language of communication.

Twelve participants were female (92.3%) and one male (7.7%). As for preferred language

of communication, nine guardians preferred English (69.2%) and four guardians preferred Spanish (30.8%).

#### *Pre-Intervention Mealtime Observations*

Key observations gathered during mealtime in the classroom include many teachers revealed many teachers serve foods and beverages for their students. Additionally, one teacher within two classrooms did not eat with their students. Lastly, eight out of ten classrooms did not talk about the benefits of foods during mealtime and three out of ten classrooms did not use positive language.

#### *Teacher Post-activity Findings*

Throughout the six-weeks, lessons were practiced during mealtime at both home and school environment. Post-activity evaluations were picked up at the end of the week or by the beginning of the next week by researchers at the centers to evaluate the practicing of mealtime tasks and any facilitators or barriers experienced by participants.

Throughout the six-week lessons; fine motor mealtime lessons during week 3, 4, and 5 were practiced the least by teachers. Results showed using the fork during week 3 was practiced 79%; having children peel foods using their hands and fingers during week 4 was practiced 67%; the spreading of foods during week 5 was practiced 74% (n=14). This is consistent with reports by teachers explaining that forks were not given to two classrooms, as well as that there were not many foods on the Head Start menu that were spreadable. Although foods at Head Start were reported to be of variety during teacher interviews, a constant barrier throughout the project was the type of foods served. Another vital finding includes all teachers did not allow their children serve either most

or all foods. Eighty-nine percent of teachers in weeks 2, 3, 4 and 6 reported allowing their students to serve all or most of their foods, whereas week 5 showed 84% of teachers. Throughout the intervention process and collection of feedback, some teachers consistently believed their students were too young to serve themselves.

Next, in order to assess whether teachers practiced the guidelines proposed by researchers, as well as if the fine motor mealtime task practiced impacted their students' in a multitude of areas, likert questions within the post-activity evaluations were analyzed. The following statements report the positive responses of teachers throughout the six weeks.

Over half of the teachers (57.9-84.2%) reported that explaining the benefits of foods to their students had a positive impact throughout the six-week intervention. A higher percentage of teachers (88.9% - 94.7%) reported encouraging their students to try at least one bite of food showed an increase in intake. Next, when asked if practicing the fine motor mealtime task increased their independence, teachers reported more than an 83% positive response every week. As for if practicing the fine motor mealtime task helped their fine motor skills, teachers reported a high percentage of positive responses 83.3% to 94.7%.

<b>Table 4. Post-activity evaluation responses among teachers weekly.</b>						
<b>Questions</b>	<b>Week 1 Pincer Grasp (n=19)</b>	<b>Week 2 Spoon (n=19)</b>	<b>Week 3 Fork (n=19)</b>	<b>Week 4 Peel (n=18)*</b>	<b>Week 5 Spread (n=19)</b>	<b>Week 6 Pouring (n=19)</b>
<b>Did you practice the fine motor mealtime task at least 3 times during breakfast or lunch this week?</b>	100% (19)	100% (19)	79% (15)	67% (12)	74% (14)	89% (17)
<b>Did you allow your students to serve, tear, and cut all or most foods and beverages?</b>	95% (18)	89% (17)	89% (17)	89% (16)	84% (16)	89% (17)
<b>Encouraging my students to try at least one bite increased their overall intake.</b>	94.7% (18)	89.5% (17)	89.5% (17)	88.9% (16)	94.7% (18)	94.7% (18)
<b>Explaining the benefits of foods increased their overall intake.</b>	57.9% (11)	78.9% (15)	68.4% (13)	72.2% (13)	84.2% (16)	78.9% (15)
<b>Allowing my students to practice [fine motor mealtime task] increased their independence.</b>	89.5% (17)	84.2% (16)	84.2% (16)	83.3% (15)	89.5% (17)	84.2% (16)
<b>Allowing my students to practice [fine motor mealtime task] increased their fine motor skills.</b>	94.7% (18)	89.5% (17)	89.5% (17)	83.3% (15)	89.5% (17)	84.2% (16)

### *Guardians Post-Activity Findings*

Since the goal of this project was to involve both the school and home environment, guardians were also given post-activity evaluations with the educational handouts to align the fine motor mealtime task with the school. Throughout the six-weeks of the project, almost every week had a 100% report rate from guardians stating they

practiced the mealtime task at least once a week, except for week 5 which had a 94.7%. Additionally, researchers wanted to assess the influence of the educational handout on guardian's understanding of the impact of each weekly fine motor skill focused on during mealtime had on their child's development. During week 1 of using the pincer grasp, week 3 of using a fork, and week 4 of peeling, guardians reported an 84.6% positive response to the education and its importance on their child's development. Whereas week 2 of using the spoon reported 76.9% positive response rate. Throughout the six weeks, guardians showed an 87% positive response rate on education during the intervention.

<b>Table 5. Post-activity evaluation responses among guardians weekly.</b>						
<b>Questions</b>	<b>Week 1 Pincer Grasp (n=13)</b>	<b>Week 2 Spoon (n=13)</b>	<b>Week 3 Fork (n=13)</b>	<b>Week 4 Peel (n=13)</b>	<b>Week 5 Spread (n=13)</b>	<b>Week 6 Pouring (n=13)</b>
<b>Did you practice the fine motor task once this week with your child?</b>	100% (13)	100% (13)	100% (13)	100% (13)	94.7% (12)	100% (13)
<b>Overall, the educational handout helped me understand why [the fine motor mealtime task] is important for my child's development</b>	84.6% (11)	76.9% (10)	84.6% (11)	84.6% (11)	100% (13)	92.3% (12)

*Classroom Observations, Field Notes, and Comments from Post-Activity Evaluations*

Key comments from interviews were clustered into specific areas of barriers and facilitators that arose among researchers during the implementation of the project. Table



6 and Table 7 reveal the clustered domains in greater detail and quotes provided by teachers and guardians.

<b>Table 6. Themes of observations, field notes and evaluation feedback in classrooms.</b>			
<b>Environment</b>	<b>Themes</b>	<b>Quotes (-)</b>	<b>Quotes (+)</b>
<b>Teachers/Classroom</b>	<b>Willingness to Practice with Child</b>	"Is this my project or yours?"; "Children are too little to serve themselves."; "Don't let this age group serve themselves."	"Some students still have weaker pincer grasps."; "We will continue to encourage the children to try and peel a banana first then we can help them if they try first."
	<b>Child's Responsiveness</b>	"Kids got frustrated when they couldn't scoop certain foods."; "Some of the children got frustrated if they couldn't peel anything and would cry."	"Kids actually like spreading food (jam on pancakes). They seemed fascinated by it."; "The children liked pouring their own milk in their cups. I think it made them feel a bit more independent."
	<b>Limitations within the Environment</b>	"Most of our food is served in smaller pieces."; "No because forks are not offered."; "We do not spread a lot of items like spread on toast."	—

<b>Table 7. Themes of observations, field notes, and evaluation feedback in home.</b>			
<b>Environment</b>	<b>Themes</b>	<b>Quotes (-)</b>	<b>Quotes (+)</b>
<b>Guardians/Home</b>	<b>Willingness to Practice with Child</b>	"[Child's name] knows how to use spoon and handles pen and pencils very well at his age."	"Thank you! Very good information, now we can learn more and help our other children."*; "They don't like the vegetables in the recipe, so I made something different that they liked and they used their utensil."
	<b>Child's Responsiveness</b>	"[Child] can be picky"; "She doesn't like some fruit, I made something different"; "My son didn't care much to eat it because the lettuce"	"He's happy to know that this was something he does every day!"
	<b>Limitations within the Environment</b>	"I helped him peel first"; "Didn't have all ingredients"; "Not enough free time"	—

## Discussion

Key points within this study include only one of the ten classrooms allowed their students to serve everything alone as well as not all classrooms practiced positive language and explained the benefits of foods during mealtime. In addition, during teacher interviews the importance of role-modeling, family style mealtime and social support between guardians and teachers is important. Furthermore, emergent themes include reteaching after holiday break and no concerns on school readiness. As for post-

intervention findings, barriers include limited materials and foods on Head Start menu as well as picky eating at home. Facilitators included increase in positive behaviors in children.

Sixty percent of children from birth to five years old spend approximately 40% of time under the supervision of someone other than the parent.<sup>10</sup> As a result, this current study focused on introducing appropriate early childhood feeding practices within a vulnerable population working with the preschool and home environment in order to influence the child's overall development. Through the collection of feedback forms, teachers indicated children enjoyed completing these tasks on their own such as serving their own milk and spreading their own foods possibly due to the increase of independence the child experienced.

This study used the Social Cognitive Theory (SCT) and Social Ecological Model (SEM) to further understand the multiple levels of influences on a child's fine motor skills and mealtime behavior. During teacher interviews, teachers expressed the importance of role-modeling and encouraging foods as well as sitting down and talking to students during mealtime. In addition to student mealtime, teachers expressed the importance of educating and helping parents when appropriate as well as how parents do not express concerns about school readiness, but most importantly if their children ate or not. For example, resilience was revealed by teachers explaining how using items around the home like squeezing a sponge can help with fine motor skills. These findings are supported by Bronfenbrenner stating the relationship between a mesosystem such as the school and the home can ultimately impact the development of the child.<sup>46</sup> These findings are supported by Johnson et al which used focus groups to understand the thoughts and

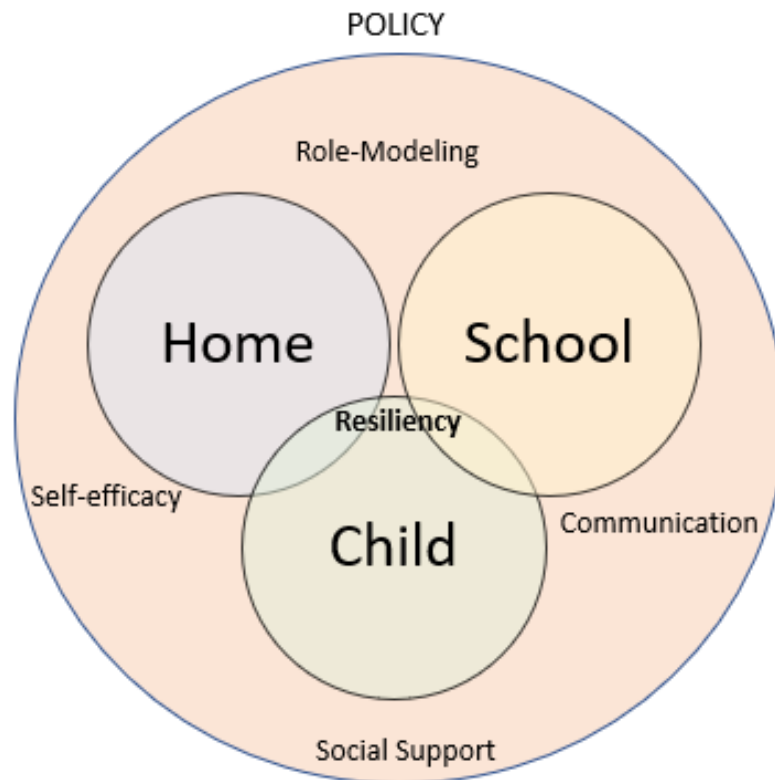
concerns on children's eating as well as ways to improve communication between early childhood program staff and parents. Additionally, results from this current study support prior research on the impact of interventions on Head Start children's motor skills.

This study revealed practicing fine motor mealtime tasks may increase independence and fine motor skills in students. Additionally, teachers encouraging the consumption of foods may also increase the student's overall intake. The findings of benefits among planned intervention are supported by past research done by Hamilton and Liu assessing the effects of interventions on gross and fine motor skill performance among Hispanic pre-kindergarten children from low socioeconomic households.<sup>5</sup> Pre-kindergarten children within the treatment group benefited from a planned motor intervention program than those who were not part of one.<sup>5</sup> Within this study, teachers and guardians were receptive.

Positive feedback among teachers and guardians included seeing changes within their students as well as reporting ease of use and no barriers. In addition, interventions such as the NAP SACC program have been used to improve both provider and caregiver nutrition, physical activity, and BMI of their students.<sup>10</sup> With planned intervention within early care and education programs, there were significant improvements in all three categories as well as the ease of use in self-assessment.

Lastly, the use of photo-texting method among guardians reduced barriers, involving a high positive engagement. Throughout this study, guardians reported no barriers and there was high participation throughout the six-week intervention. This information is consistent with findings done by Best Food FITS revealing the photo-texting method as convenient and effective as well as reducing labor by participant

fatigue.<sup>50</sup> Overall, this reduced barriers. At first, there was a reluctance to take on fine motor and mealtime coaching. Working with guardians, teachers, and children reduced barriers. These barriers included time, communication with families, as well as the photo-texting facilitation within guardians. Furthermore, this unique methodology allowed researchers to explore an alternative method to work with both families and teachers in order to positively influence the child.



**Figure 3. Model incorporating the levels of influence using theory.**

### **Limitations**

This study included some limitations. Since this study was done in two Head Start centers in San Marcos, Texas, there is limited generalizability. In addition, another limitation was the self-reported measures such as the post-activity evaluation bias. Although this provides bias, this indicates teachers and guardians are willing to practice an intervention and the next steps they are willing to take. Additionally, this study had

limited funding and is a local area descriptive study. Due to the current study being a pilot study, it was expected researchers would encounter many obstacles.

### **Implications for research and practice**

Overall, findings from the current study may inform incorporating fine motor skill development during mealtime is a promising strategy and overall can be done. First, the results of this study provide important insight on facilitators and barriers regarding fine motor skills during mealtime in preschool children. An intervention can be created to target these barriers experienced by teachers and guardians during the pilot study. Additionally, longer interventions should be done using more complex fine motor mealtime tasks such as folding and additional wrist movements. Additionally, due to the positive engagement through photo-texting, researchers should consider the benefit of technology for guardians. Lastly, with the proper funding, future studies can assess the benefit of a planned intervention treatment group versus a control group during a fine motor mealtime intervention.

## V. CONCLUSION

The aim of this study was to assess the feasibility of six-week mealtime curricula to promote fine motor skill development among Head Start classrooms and families and to discover facilitators and barriers regarding mealtime. This study was an expansion of the Caminitos Collaborative and Best Food FITS project which gathered past research focusing on a multitude of areas. Previous research for these projects includes a focus on fine motor skill development, the population of Head Start and Early Head Start as well as early childhood feeding practices. This study focused on influencing a child's fine motor skills through the home and classroom mealtime environment by focusing on domains such as teacher interviews, classroom observations, teacher and guardian feedback forms and the photo texting method as a form of communication for guardians. Incorporating fine motor mealtime tasks within the home and school environment may increase a child's development as well as independence and autonomy. This study was built on literature targeting fine motor education and translation on using mealtime as an avenue for child development.

Researchers used the SCT and SEM to develop interviews that gathered teachers' knowledge, self-efficacy, resiliency, and perceptions of home mealtime environment. Through the interview process, researchers found out teachers have a difficult time getting children back into routine after holiday break. Teachers shared students must be retaught skills and foods even though they were once used to these behaviors. In addition, teachers expressed resiliency by providing suggestions to guardians while trying to not be forceful or intrusive. Through mealtime observations, researchers witnessed some teachers did not let their students serve themselves even though they expressed the proper

social support of Head Start through family style as well as themselves allowing students to serve themselves. Additionally, researchers were able to gather any facilitators and barriers through field notes and feedback forms. In the classroom, barriers included the foods and utensils provided whereas facilitators included the ease of use. As for the home, facilitators included child's responsiveness and guardians feeling as they can use these tips with their other children. Using the photo texting method was a great avenue to communicate with guardians who may not have time to talk during center visits due to additional priorities such as work and other children.

In conclusion, this study had both facilitators and barriers when implementing an intervention in the classroom and home. Future studies should work with different levels of influence such as the home, school, neighborhoods and communities using accessibility, availability and barriers to improve the environments Focusing on the physical environment can then impact the social environment and individual factors such as this study did when addressing a child's behaviors and skills. Creating interventions in which incorporate both the home and school environment will positively influence children's skills and behaviors.



## **APPENDIX SECTION**

A. INTERVIEW GUIDE .....	63-64
B. OBSERVATIONAL LIST.....	65
C. EXAMPLE OF LESSON MODULES FOR GUARDIANS.....	66
D. POST-EVALUATION FORM- GUARDIANS .....	67-68
E. POST-EVALUATION FORM- TEACHERS .....	69-70

## APPENDIX A: INTERVIEW GUIDE

### Interview Guide

**Mediator says:** Hello, my name is Kasandra Perez and I am a graduate research student at Texas State University. I am here to gather data for my thesis project on how to improve fine motor skills through common feeding practices such as using a spoon or a fork when eating in your students. I am asking you to take part in this study because you are a teacher at A Washington or Henry Bush and work with children from the ages of 0 to 5. The research I am doing will be helpful in understanding what you, your students and their families need to help a child's development.

This interview will be recorded, do I have your permission to record this interview? If yes, the interview will be around 15 minutes and the incentives for participating is a Best Food FITS t-shirt and a drawing to win a cooking appliance at the end of the project. There are no known risks to participate in the study. The information I collect from you will have no identifiable information and any quotes provided will be de-identified. All recordings will be destroyed after they are transcribed.

Do you have any questions before we begin?

#### **Teacher's knowledge on fine motor skills importance:**

1. Overall, tell me what you do to address fine motor development in your students?
2. How important do you believe the proper development of fine motor skills is important for a child to succeed in school?
  - a. If yes, in what ways?

#### **Teachers and early childhood feeding practices:**

3. When did you first learn about the importance of self-feeding in children?
4. Do you use feeding practices to address fine motor development in your students?
  - a. If yes, in what ways?
5. Do you believe Head Start administration encourages students to feed themselves?
  - a. If yes, in what ways?

6. To your knowledge, what is the mealtime activity you feel your students have the most trouble with during mealtime?

**Teachers' beliefs on environmental influences surrounding students' mealtime practices:**

1. What do you believe is influencing the foods your students eat in your classroom?
2. As for utensils, what do you believe is influencing how your students' use a spoon or fork during mealtime?
3. What do you believe is influencing your student's capability of remaining attentive during mealtime?
4. What are your perceptions on the type of foods your students eat at home and why?
5. Do you believe parents/guardians enforce the use of utensils in your students?
  - a. Why or why not?
6. Do you believe students practice family-style meals at home?
  - a. Why or why not?
7. Based on what you see during mealtime in the classroom, what do you believe parents/guardians practice at home that are unhealthy or diminishing their child's fine motor skills?

**Teacher and Parent Social Cognitive Theory Home Meeting:**

1. What seems to be the main concerns parents have about their child's eating on-site?
2. If any, what concerns do parents have about their child's ability to use a spoon or fork at home?
3. If any, what concerns have parents expressed about their child possibly not being school ready?
4. In what form do you believe is the easiest way to communicate effectively with parents?

**Teacher and Parent Support:**

1. What do you believe you and parents can do together to support a child's fine motor development and nutritional intake?

Mediatory: Thank you, that concludes the interview and all the questions I have for you. Thank you so much for your time and all of your input. Your answers are valuable to this study.

## APPENDIX B: OBSERVATIONAL LIST

**Please answer the following questions if classroom entitles toddlers or preschool children.**

**Location:**

**Age group:**

<i>Check all that apply.</i> <b>During meal or snack time, which of the following is practiced:</b>	<b>Yes</b>	<b>No</b>
1. Meals and snacks at center/school are already pre-plated and set portioned for children		
2. Teacher portions meals/snacks for children onto their plate		
3. Children are allowed to serve themselves <i>some</i> foods on their own, while other foods are served onto their plates		
4. Children are allowed to serve themselves <i>most</i> of the foods on their own		
5. Children are allowed children to serve themselves <i>all</i> the foods on their own		
<i>Check all that apply.</i> <b>Teachers role model the consumption of healthy foods by:</b>	<b>Yes</b>	<b>No</b>
1. Eating the healthy food items with them		
2. Using positive language such as “these peas taste yummy!”		
3. Talking about the benefits of the healthy foods such as “this broccoli will make you so strong”		
4. Teachers sit down and eat with the children, not just feed them		

## Week 2: Using the spoon!



### Why is using a spoon to eat important?

Allowing your child to use a spoon on their own when eating can help them with many future skills!

#### Spoon usage will help your child:

- Reach and grasp other tools like a pencil or paintbrush
- Work on their own
- Problem solve
- Build hand and grasp strength
- Use hand and eye coordination

### What can I do to help my child use a spoon?



- Allow child to serve themselves
- Involve child in making meals like scooping and mixing ingredients
- Use a child-sized spoon
- If your child is having trouble using a spoon, guide their hand
- Serve foods in different consistencies like oatmeal, soup, and apple sauce.

### Fun Fact

Children are usually ready for solid foods around 4 to 6 months!

### Fruity Homemade Oatmeal

Start the day off with breakfast to help with energy, concentration and mood!



#### Ingredients for 2 servings:

- $\frac{3}{4}$  cup of old-fashioned rolled oats
- 2 tablespoons raisins or currants
- 1 apple (cored and chopped)
- 1 teaspoon cinnamon
- 1  $\frac{1}{2}$  cups of water or milk

#### Directions:

1. Use a vegetable peeler to remove the skin from the apple. **For more fiber, leave skin on apple.**
2. Cut the core out of the apple and chop the apple into small pieces.
3. Put the water or milk in a saucepan.
4. Boil the water or milk on medium heat.
5. Stir in the old-fashioned oats, raisins, chopped apple, and cinnamon.
6. Turn heat to low.
7. Cook for 5 minutes and stir often.

Information exerted from the Center of Disease and Control and Head Start websites

# APPENDIX D: POST-EVALUATION FORM- GUARDIANS

1. Did you practice the pincer grasp with your child at least once this week?

Yes	No

If no, what are some of the problems you faced? \_\_\_\_\_

2. The educational handout helped me understand how the pincer grasp helps my child's ability to hold small objects.

Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree

3. The educational handout helped me understand how the pincer grasp helps my child's *independence*.

Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree

4. The educational handout helped me understand how the pincer grasp helps my child's *pinch and hand strength*.

Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree

5. The educational handout helped me understand how the pincer grasp helps my child's ability to use *hand and eye coordination*.

Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree

6. Did you allow your child to use the pincer grasp when eating "grab and go" foods?

Yes	No

7. Did you encourage your child to practice the pincer grasp when feeding themselves?

Yes	No

If no, what are some problems you  
faced?\_\_\_\_\_

8. Did you allow your child to use the pincer grasp with snacks such as bananas, apples, and cubed cheese?

Yes	No

If no, what are some problems you  
faced?\_\_\_\_\_

9. The educational handout helped me understand why it is important to pair familiar foods with unfamiliar ones.

Yes	No

If no, what are some problems you  
faced?\_\_\_\_\_

10. Overall, the educational handout helped me understand why my child using the pincer grasp to pick up foods is important in their development.

Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree

Additional  
Comments:\_\_\_\_\_

# APPENDIX E: POST-EVALUATION FORM- TEACHERS

***Please check whichever applies best to the question or statement being asked.***

1. Did you practice the fine motor mealtime task at least 3 times during breakfast or lunch this week?

Yes	No

If no, what problems did you face?\_\_\_\_\_

2. Did you encourage your students to have one bite of food when they did not want to try it?

Yes	No

3. Encouraging my students to try at least one bite increased their overall intake.

Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree

4. Did you offer and provide water at the table during mealtime?

Yes	No

5. Offering and providing water at table increased water intake in my students.

Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree

6. Explaining the benefits of foods increased the foods my students ate improved their overall intake.

Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree

7. Did you allow your students to serve/tear/cut **most** foods and beverages?

Yes	No

8. Allowing my students to practice pouring themselves increased their *independence*.



Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree

9. Allowing my students to practice pouring themselves increased their *fine motor skills*.

Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree

10. Allowing my students to practice pouring themselves increased their *self-regulation* on how much food they served.

Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree

11. Additional comments: \_\_\_\_\_

\_\_\_\_\_

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