



2014

A Study Examining the Effectiveness of a Sensory-Based Feeding Group for Children with Problematic Eating Behaviors

Laura Notch
University of North Dakota

Brionna Simenson
University of North Dakota

Follow this and additional works at: <https://commons.und.edu/ot-grad>

 Part of the [Occupational Therapy Commons](https://commons.und.edu/ot-grad)

Recommended Citation

Notch, Laura and Simenson, Brionna, "A Study Examining the Effectiveness of a Sensory-Based Feeding Group for Children with Problematic Eating Behaviors" (2014). *Occupational Therapy Capstones*. 329.
<https://commons.und.edu/ot-grad/329>

This Scholarly Project is brought to you for free and open access by the Department of Occupational Therapy at UND Scholarly Commons. It has been accepted for inclusion in Occupational Therapy Capstones by an authorized administrator of UND Scholarly Commons. For more information, please contact zeineb.yousif@library.und.edu.

A Study Examining the Effectiveness of a Sensory-Based Feeding Group for Children
with Problematic Eating Behaviors

by

Laura Notch, MOTS, and Brionna Simenson, MOTS
Master of Occupational Therapy, University of North Dakota, 2013

Advisor: Janet Jedlicka, Ph.D, OTR/L

An Independent Study

Submitted to the Occupational Therapy Department

of the

University of North Dakota

In partial fulfillment of the requirements

for the degree of

Master of Occupational Therapy

Grand Forks, North Dakota

May

2014

This Independent Study Paper, submitted by Laura Notch, MOTS, and Brionna Simenson, MOTS in partial fulfillment of the requirement for the Degree of Master of Occupational Therapy from the University of North Dakota, has been read by the Faculty Advisor under whom the work has been done and is hereby approved.

Signature of Faculty Advisor

Date

PERMISSION

Title: A Study Examining the Effectiveness of a Sensory-Based Feeding Group for Children with Problematic Eating Behaviors

Department: Occupational Therapy

Degree: Master of Occupational Therapy

In presenting this Independent Study in partial fulfillment of the requirements for a graduate degree from the University of North Dakota, we agree that the Department of Occupational Therapy shall make it freely available for inspection. We further agree that permission for extensive copying for scholarly purposes may be granted by the professor who supervised our work or, in her absence, by the Chairperson of the Department. It is understood that any copying or publication or other use of this Independent Study or part thereof for financial gain shall not be allowed without our written permission. It is also understood that due recognition shall be given to us and the University of North Dakota in any scholarly use which may be made of any material in our Independent Study Report.

Signature

Date

Signature

Date

TABLE OF CONTENTS

LIST OF TABLES.....	v
ACKNOWLEDGEMENTS.....	vi
ABSTRACT.....	vii-viii
CHAPTERS	
I. INTRODUCTION.....	1-6
Statement of the Problem.....	2
Theoretical Foundation.....	3
Statement of the Purpose.....	4-5
II. REVIEW OF LITERATURE.....	7-29
III. METHODOLOGY.....	30-35
IV. DATA ANALYSIS.....	36-42
Presentation of Data.....	36-39
Interpretation of Data.....	40-42
V. CONCLUSIONS.....	43-45
Limitations.....	44
Recommendations.....	44-45
REFERENCES.....	46-56
APPENDICES.....	57-63

LIST OF TABLES

Table	Page
1. CEBI Total Eating Score.....	37
2. Significant Items on CEBI.....	38
3. CEBI Total Problems.....	39

ACKNOWLEDGEMENTS

The authors wish to acknowledge those who contributed knowledge and support during completion of this independent study. A special thank you goes to our advisor, Dr. Janet Jedlicka, for her guidance and dedication throughout the process and completion of this project. We would also like to thank Dr. Sarah Nielsen for her assistance during data analysis with SPSS. Finally, we would like to thank all staff members at the early intervention center who contributed to and participated during implementation of this independent study; without support of the administration, occupational therapists, and speech language pathologists involved with the sensory-based feeding group, this independent study would not have been possible.

ABSTRACT

KEY WORDS: *children, problematic eating behaviors, sensory, intervention*

OBJECTIVE: The purpose of this pilot study was to analyze the process and outcomes of a routine sensory-based feeding group on a child's problematic eating behaviors.

METHODS: An experimental pretest-posttest research design was used to gather and analyze quantitative and qualitative data on 4 children who demonstrated problematic eating behaviors. The children participated in a routine 8-week sensory-based feeding group, which utilized sensory activities to promote change. The Children's Eating Behavior Inventory (CEBI) and the Feeding Intake Form (FIF) were completed through parental report prior to and upon completion of the intervention. Analysis focused on decreased problematic eating behaviors and improved behaviors during mealtimes.

FINDINGS: As a result from the CEBI, 50% of children experienced a decrease in total eating score and 1 out of 4 parents reported a decrease in their child's problematic eating behaviors. Fifty percent of parents reported less fighting about feeding during mealtimes, as concluded by FIF results. Children also became comfortable with the routine of the intervention and all children made improvements along the food continuum.

CONCLUSIONS: Problematic eating behaviors impact a child's growth and development and can interrupt family dynamics and mealtime routines. Based on results from this pilot study, a sensory-based feeding group has the potential to decrease a child's problematic feeding behaviors and improve mealtime experiences through

parental and child participation. These results are beneficial to improve interventions provided by pediatric occupational therapists.

CHAPTER 1

INTRODUCTION

Eating is a fundamental aspect of a child's life. A child should consume a balanced diet to ensure healthy growth and development. Parents with children of all ages, race, gender, and socioeconomic status may experience difficulties feeding their child a nutritious and healthy meal (Carruth, Ziegler, Gordon, & Barr, 2004a). Feeding problems are common in children; it is estimated between 20% and 40% of children exhibit some form of a feeding problem (Laud, Girolami, Boscoe, & Gulotta, 2009). In addition, researchers have noted an overwhelming number of children who demonstrate feeding problems and also have developmental disabilities and/or diagnosis of an autism spectrum disorder (Schreck, Williams, & Smith, 2004). Parents who have children with a diagnosis of autism have reported their child has increased texture and food selectivity during mealtimes, when compared to children without autism (Schreck et al., 2004). Regardless of a physical and/or developmental disability diagnosis, many children experience problematic eating behaviors.

The definition of problematic eating behaviors is important to consider in regards to a child's eating and feeding experience. Problematic eating behaviors include: lacking interest in food, eating small meals, eating slowly, lacking willingness to try new foods, accepting a limited number of foods, and having a limited intake of vegetables and other specific foods (Dubois, Farmer, Girard, Peterson, & Tatone-Tokuda, 2007). The prevalence of problematic eating behaviors is an issue during early stages of child development and presents problems during mealtimes.

Statement of the Problem

Parents anticipate and expect their infant or child to grow in a healthy way. When a child demonstrates problematic eating behaviors, concerns arise regarding the overall growth and development of the child. Children who demonstrate acute feeding problems may be susceptible to chronic illness, growth failure, cognitive development deficits, and future eating disorders (Chatoor & Macaoay, 2008). Problematic eating behaviors can also cause stress within family dynamics and can interrupt mealtime routines (Carruth et al., 1998; Galloway, Fiorito, Lee, & Birch, 2005). In order to promote healthy growth and development in children, as well as relieve stress that can occur during mealtimes, it is necessary to identify and utilize interventions that may reduce or eliminate a child's problematic eating behaviors.

Sensory sensitivities may also contribute to problematic eating behaviors. Researchers have found that sensory over-responsiveness is present in individuals of all ages (Reynolds & Lane, 2008). When an individual demonstrates over-responsiveness, he/she avoids stimuli that is unpleasant, which may lead to a limited diet due to sensitivity to taste, smell, or textures of certain foods (Reynolds & Lane, 2008). The

principal investigators of this research study aimed to determine if a child's problematic eating behaviors would decrease following completion of a sensory-based feeding program that addressed over-responsiveness in children.

Importance of the Study

Based on a review of literature, there is a gap in current research involving sensory-based interventions and their impact on problematic eating behaviors. Therefore, a research study determining the effectiveness of a sensory-based feeding group and its impact on problematic eating behaviors is significant to the field of occupational therapy as well as to parents/caregivers who encounter feeding difficulties with their children.

Theoretical Framework

A theoretical framework was incorporated to determine the problem, implement the research, perform data analysis, and formulate results. The Person-Environment-Occupation-Performance model (PEOP) was one theory that guided the research. The PEOP model is client-centered and focuses on improving everyday performance of valued occupations (Baum & Christiansen, 2005). One major assumption of the PEOP model is the interaction of person factors and environmental factors that support, enable, or restrict performance of valued occupations for an individual (Baum & Christiansen, 2005). Occupational therapy interventions guided by the PEOP model include purposeful, client-centered strategies to engage the individual and enable successful performance in desired meaningful occupations (Baum & Christiansen, 2005). In addition to the PEOP model, a sensory integration frame of reference was chosen to guide this research study.

The sensory framework chosen to guide this research study was Winnie Dunn's Model of Sensory Processing. Sensory integration is defined as the brain's ability to organize sensory information received from the environment and body to produce an adaptive response (Cole & Tufano, 2008). Winnie Dunn (1997) developed a model for sensory processing with three main features: consideration to the individual's neurological threshold, consideration of the response and/or self-regulation strategy, and consideration of how the threshold and response strategies interact (Dunn, 1997). Dunn (2001) does not consider patterns of sensory processing as a disability, but rather a reflection of the individual, which ultimately offers insight to how the individual manages daily occupations. An occupational therapist (OT) can create interventions to match the sensory needs of an individual, or offer increased amounts of sensory input based on the individual's changing needs (Cole & Tufano, 2008). An OT should follow cues through observation of a child, as the child knows most about his/her individual sensory stimulation and tolerance levels (Cole & Tufano, 2008). The PEOP model and Winnie Dunn's Model of Sensory Processing were appropriate theoretical frameworks in relation to the research problem and purpose.

Statement of the Purpose

The purpose of this independent study was to analyze the process and outcomes of a routine sensory-based feeding group on a child's problematic eating behaviors. The intervention group was lead by three licensed occupational therapists and two licensed speech-language pathologists at an early intervention center located in the upper Midwest. Permission was received by the early intervention center CEO (Appendix A) as well as from the early intervention center staff (Appendix B). Children were chosen as

the subject population for this study because problematic eating behaviors can affect a child's growth and development. The principal investigators focused on determining the effectiveness of the sensory-based feeding group on decreasing problematic eating behaviors in children after completion of the eight-week feeding program.

Definition of Terms

Problematic Eating Behaviors: lacking interest in food, eating small meals, eating slowly, lacking willingness to try new foods, accepting a limited number of foods, and having a limited intake of vegetables and other specific foods (Dubois et al., 2007).

Sensory Integration: the brain's ability to organize sensory information received from the environment and produce an adaptive response (Cole & Tufano, 2008).

Sensory Feeding Group: a specific routine followed during a sensory-based feeding group. Sensory activities are incorporated into the routine and include: heavy work, proprioceptive input, blowing bubbles, dancing, jumping on a trampoline, crawling through a tunnel, and preparing the table to eat. During the eating portion of the intervention, foods are chosen based on a variety of sensory qualities such as shape, texture, and color.

Food Continuum: foods are selected from the food continuum to incorporate during each sensory-based feeding group. Ten foods are organized in a specific manner based on sensory properties. When selecting foods and the order of eating, only one property changes (i.e. shape, color, texture).

Assumptions

The principal investigators assume a child's problematic eating behaviors will decrease after participation in a routine eight-week sensory-based feeding group. It is also assumed the parent/caregiver of the child will report decreased problematic eating behaviors during family mealtime routines. The principal investigators assume parents will have increased enjoyment and interactions with their child during mealtimes.

Based on the problems identified for children who demonstrate problematic eating behaviors, the principal investigators conducted a thorough literature review. The topics included in the literature review consisted of: normal child developmental patterns, problematic eating behaviors, possible interventions, family dynamics, and sensory processing in children. Chapter II outlines the completed literature review.

CHAPTER II

THE LITERATURE REVIEW

Eating is an important occupation in a child's life that promotes healthy growth and development. A literature review was conducted to analyze a child's developmental progression through childhood and problematic eating behaviors that may develop. Literature was found in regards to healthy/normal developmental growth patterns, diagnoses related to problematic eating behaviors, mealtime challenges, sensory-related problems, the impact of family dynamics, and effective occupational therapy interventions. Numerous research studies have been conducted on the prevalence of problematic eating behaviors, and the impact of these behaviors on a child's growth and development (Carruth et al., 2004a; Chamberlin, Henry, Roberts, Sapsford, & Courtney, 1991; Foy et al., 1997; Girolami et al., 2007; Kerwin, Eicher, & Gelsinger, 2005; Laud et al., 2009; Provost, Crowe, Osbourn, McClain, & Skipper, 2010; Williams, Field, & Seiverling, 2010). However, a majority of the research studies have been non-experimental designs, which lack determination of the effectiveness of an intervention on a child's problematic eating behaviors.

Normal Development

Infants begin to grow and develop from the day they are born. There are typical stages and/or milestones in which healthy development takes place. For example, children generally begin crawling, walking, and talking by a certain age. Children develop physically and cognitively as they age and normal development is influenced by

a child's nutritional intake. To ensure healthy growth and development, children should consume a wide variety of foods as a part of their regular diet. Researchers have examined normal development and typical stages of a child's growth and development (Butte et al., 2004; Carruth & Skinner, 2002; Carruth et al., 2004b; Ross & Browne, 2002).

Normal development is a multidimensional process with various factors contributing to healthy progression. Ross and Browne (2002) described development as, "a process that involves an individual's ability to integrate new demands and new information, achieving stability at a new developmental level" (p. 470). If an individual is unable to integrate new demands and new information, the developmental process may be interrupted. During opportunities for infants to learn and develop, there is a period of physiologic, motor, and state instability, as the infant attempts to integrate new information and/or new demands (Ross & Browne, 2002). The goal of a developmental opportunity is for the infant to obtain stability; however, if instability is too great, the infant may experience difficulties processing the information, which could ultimately influence his/her ability to integrate new demands and continue the process of healthy development (Ross & Browne, 2002). Each developmental opportunity constitutes learning skills for an infant to utilize during engagement in occupations.

A child transitions through stages during growth and development. In 2004, Butte et al. created a feeding guide that emphasized eating skills, physical skills, hunger and fullness cues, and foods and textures appropriate for various stages of development, to ensure healthy growth of infants and toddlers. The following information includes stages of normal development that could influence a child's problematic eating behaviors.

Newborn stage. Feeding skills are part of a child's developmental progression. Butte et al. (2004) identified the first stage as the newborn stage. An infant will cry or fuss when hungry and establish a suck-swallow-breathe pattern during breast or bottle-feeding of breast milk or infant formula; the infant will generally stop sucking when he/she is full (Butte et al., 2004). The newborn stage requires basic eating skills and is followed by the head up stage.

Head up stage. During the head up stage, the child initiates movement of his/her tongue forward and backward to suck (Butte et al., 2004). The oral motor development of moving the tongue back and forth and around the mouth to swallow typically occurs between 2 to 10 months of age (Carruth & Skinner, 2002). The child demonstrates hunger through crying and fussing, and stops sucking when full (Butte et al., 2004). The appropriate foods during the head up stage is breast milk or infant formula, which is similar to the newborn stage (Butte et al., 2004). Following this stage of development, a child should progress to supported sitting.

Supported sitter stage. During the supported sitter stage, the child should be able to push food out of his/her mouth with the tongue, recognize a spoon, and hold the mouth open as a spoon approaches (Butte et al., 2004). A child tends to reach for a spoon when hungry around 2.5 to 9.5 months of age (Carruth & Skinner, 2002). This stage introduces thin pureed foods and turning the head away from a spoon when full (Butte et al., 2004). A child may also swipe food toward the mouth when hungry, which is different from crying and fussing during the newborn and head up stages (Butte et al., 2004). The infant will then transition to the independent sitter stage after supported sitting.

Independent sitter stage. During the independent sitter stage, thick pureed foods are introduced (Butte et al., 2004). The child begins to point to food when hungry and clenches the mouth shut or pushes food away when full (Butte et al, 2004). A child transitions from pushing food out of the mouth to keeping food in the mouth. The child is also able to pull the head downward and press the upper lip to draw food from the spoon, rake food toward self using a fist, transfer food from one hand to the other, and drink from a cup held by a feeder (Butte et al., 2004). Carruth and Skinner (2002) determined a child transfers food from one hand to the other and feeds oneself a cookie or cracker between 4 and 14 months of age, and from 5 to 20 months a child uses his/her fingers to rake food towards self. Carruth et al. (2004b) found that 98% of children aged 9 to 11 months were able to grasp food with their hands. The independent sitter stage is followed by the crawler stage.

Crawler stage. Foods that are soft with tiny noticeable lumps and crunchy foods that dissolve are introduced during the crawler stage (Butte et al., 2004). A child begins to chew softer foods at 6 to 14 months of age and eat food with tiny lumps between 4.8 and 15.5 months (Carruth & Skinner, 2002). The crawler stage is when a child learns to move the tongue from side to side to transfer food in the mouth and use the jaw and tongue to mash food (Butte et al., 2004). A child begins playing with a spoon during mealtimes, but not use it for self-feeding. However, the child will feed himself/herself finger foods by holding small foods between the thumb and first finger (Butte et al., 2004). A child uses his/her fingers to self-feed soft and chopped food between 9.5 to 20 months of age (Carruth & Skinner, 2002). A child is also able to hold a cup

independently during this stage (Butte et al., 2004). After the crawler stage is the beginning to walk stage.

Beginning to walk stage. The beginning to walk stage is characterized by children biting through a variety of textures and bite-sized pieces of foods that are coarsely chopped (Butte et al., 2004). A child begins to use words to express hunger and demands to spoon-feed himself/herself. Chewing becomes more skillful and the child is able to drink from a straw, hold a cup with two hands and take swallows, and dip a spoon in food rather than scooping the food (Butte et al., 2004). Carruth et al. (2004b) determined that 99% of children aged 15 to 24 months were able to eat foods that require chewing. Following the beginning to walk stage is the independent toddler stage.

Independent toddler stage. Lastly, the independent toddler stage is when a child chews and swallows firmer foods skillfully, learns to use a fork for spearing, uses a spoon with less spilling, and can hold a cup in one hand and set it down skillfully (Butte et al., 2004). Carruth and Skinner (2002) found that children ages 7.5 to 20 months of age chew and swallow firmer foods without choking. The independent toddler uses an increased amount of communication and gestures to express hunger and a desire to eat, as well as conclusion of a mealtime (Butte et al., 2004). The toddler plays with food and becomes more efficient at eating a variety of food textures utilizing a controlled bite pattern (Butte et al., 2004). Ninety-nine percent of children aged 19 to 24 months were able to drink from a sippy cup without help (Carruth et al., 2004b) and by 24 months, 80% of the children were self-feeding (Carruth & Skinner, 2002). The child in the independent toddler stage demonstrates improved eating and feeding skills during mealtimes. These

seven stages of development are imperative to a child's ability to perform self-feeding, and a delay in development can negatively influence the child's performance.

Food Acceptance Patterns

A child develops food acceptance patterns based on various external factors. A child's food preferences begin to form as early as 2 years of age (Skinner, Carruth, Bounds, & Ziegler, 2002). Several researchers have studied the effect of external factors on a child's mealtime behaviors and/or food preferences (Birch, 1998; Birch & Fisher, 1998; Harris, 2008, Skinner et al., 2002). Examples of external factors include the physical environment, social interactions, observation of others, cultural patterns, etc. Harris (2008) conducted a review of research based on a child's development of taste and food preferences and found external factors that contribute to a child's development were: cultural differences in weaning practices, exposure to and programming of tastes through breast-feeding or weaning, exposure to a variety of textures, modeling, conditioned preferences, and appetite regulation. Birch and Fisher (1997) also found that a child's food preferences were influenced by early learning experiences, social contexts, societal influences through television, familiar feeding practices, and parental control. A child's food acceptance patterns may vary depending on external factors. Skinner et al. (2002) conducted a longitudinal study and found that a child's food preferences were significantly correlated to a mother's preferences. Being a mother or parental figure controls foods eaten by his/her child, parental control is a factor in the child's development of food preferences. A child's eating behaviors and preferences are influenced by various external factors.

Definition of Problematic Behaviors

Children experience a variety of mealtime challenges related to problematic eating behaviors. Examples of problematic eating behaviors include: food neophobia, picky eating, restricted diet, lack of interest in food, eating small meals, eating slowly, lack of willingness to try new foods, accepting a limited number of foods, and having a limited intake of vegetables and other specific foods (Birch, 1998; Cooke, Carnell, & Wardle, 2006; Crist & Napier-Phillips, 2001; Dubois et al., 2007; Field, Garland, & Williams, 2003; Lewinsohn et al., 2005). Despite the type of problematic eating behavior, challenges can occur during mealtimes and/or proper consumption of an adequate diet for a child's healthy growth and development. Problematic eating behaviors influence a child's overall eating and/or feeding experience.

Food neophobia is defined as an infant's fear or rejection of new food (Birch, 1998). Food neophobia can influence an infant's interest and acceptance of a variety of foods. Cooke et al. (2006) found that children aged 4 to 5 years old who demonstrated food neophobia ate less fruits, vegetables, and protein. The problematic behavior of food neophobia can influence a child's nutritional intake.

Picky eating is also a problematic eating behavior experienced by children. Picky eaters are typically children who either present difficulties when attempting to try new foods (food neophobia) and/or have a limited variety of food intake, a restricted diet (Crist & Napier-Phillips, 2001). Carruth et al. (1998) discovered that picky eaters typically limit food choices, are unwilling to try new foods, avoid specific foods, and demonstrate food preferences related to presentation and preparation methods. Picky

eating presents challenges for both children and their parent/caregiver during mealtimes and the overall feeding/eating experience.

Other factors that relate to problematic eating behaviors are a child's age, environmental factors, and/or diagnosis. There are different ages in which a child demonstrates varied problematic eating behaviors. Esparó et al. (2004) researched feeding problems in 1,104 nursery children and discovered a greater prevalence of feeding problems in children aged 3 to 4 years old, which is the phase in which eating habits begin to form. Fallon, Rozin, and Pliner (1984) conducted a research study documenting food rejection patterns of children ages 3.5 to 12 years of age and found that children reject foods based on taste (distaste), anticipation of harm following ingestion (danger), where food comes from in terms of rejection of food that could become offensive (disgust) and/or rejection of food that is simply not food (inappropriateness). Researchers concluded that 4-year-old children reject food from all four of these categories (Fallon et al., 1984). Also, Crist and Napier-Phillips (2001) conducted a research study on mealtime behaviors of three clinical samples: a normative sample (any child within the study age range who entered the physician's office and agreed to participate in the study), a clinical/non-medical sample (children from planned admissions with no medical issues identified), and a clinical/medical sample (children from planned admissions with medical factors that contributed directly to feeding difficulties). The researchers indicated the frequency of behaviors was greater for clinical groups, however, the types of behaviors across all samples were similar; there was a difference between younger and older children in that younger children were more likely to whine, cry, throw tantrums, and spit out food, while older children got up from the

table during meals, delayed eating by talking, requested junk food after a meal, and attempted to negotiate what was eaten during the mealtime (Crist & Napier-Phillips, 2001). Problematic eating behaviors differ depending on the age of the child.

Environmental influences also contribute to problematic eating behaviors. Lewinsohn et al. (2005) researched problematic eating and feeding behaviors of 36-month-old children and found that mothers reported their child most often spit out food and/or became upset when food was restricted. Four domains were associated with problematic eating behaviors: pickiness (i.e. child eats a limited variety of food), food refusal (i.e. child refuses to eat specific foods), struggle for control (i.e. frequent struggles with child over food), and positive parental behavior (praising child about food intake). The researchers found a relation between struggle for control and problematic eating behaviors, food refusal and mothers' lifetime history of psychopathology, and pickiness to mothers' lifetime history of alcohol dependence (Lewinsohn et al., 2005). Powell, Farrow, and Meyer (2011) also found a child's food avoidant eating behaviors were strongly associated to maternal-controlling feeding practices, behavior regulation, low encouragement of a balanced diet, and low provision of a healthy food-related home environment. The environment in which a child is raised can influence his/her development of food acceptance patterns and eating behaviors.

Despite a child's age or the physical environment, a childhood diagnosis can also influence problematic eating behaviors. Field et al. (2003) conducted a research study on 349 children and identified five feeding problems: food refusal, selectivity by texture, selectivity by type, oral motor delays, and dysphagia. Researchers found that food selectivity by type and texture was most common amongst children with an autism

spectrum disorder, and gastroesophageal reflux was highly correlated with food refusal and dysphagia (Field et al., 2003). Problems during mealtimes can also occur due to developmental limitations and general medical problems. Motion, Northstone, Emond, and the ALSPAC Study Team (2001) conducted a population-based study on a large representative sample in regards to feeding difficulties and associated growth and developmental problems; children with persistent feeding difficulties within the first 15 months of life experienced significant developmental impairments in motor, language, and behavior development. These developmental impairments could ultimately influence a child's healthy growth and development. Rommel, De Meyer, Feenstra, and Veereman-Wauters (2003) found a combination of medical and oral problems were most associated with feeding problems. Diagnoses related to development, behavior, or medical factors can influence a child's problematic eating behaviors.

Childhood Diagnoses

Developmental and physical diagnoses during childhood can influence mealtime behaviors and development of eating skills and food preferences. There are common diagnoses associated with an increased amount of problematic eating behaviors. Children with an autism spectrum disorder (ASD), pervasive development disorder (PDD), and/or developmental delays may exhibit an increased amount of problematic eating behaviors. An additional concern that presents difficulties during development of eating/feeding skills is swallowing disorders.

Numerous researchers have studied child problematic eating behaviors associated to a diagnosis of ASD (Bennetto, Kushner, & Hyman, 2007; Cermak, Curtin, & Bandini, 2010; Emond, Emmett, Steer, & Golding, 2010; Martins, Young, & Robson,

2008; Provost et al., 2010). Children diagnosed with an ASD demonstrate problematic behaviors during mealtime and altered food acceptance patterns. Emond et al. (2010) found that children with an ASD had a less varied diet and late acceptance of solid foods. Parents reported children with an ASD were difficult to feed and very choosy (Emond et al., 2010). Also, Provost et al. (2010) conducted a study comparing mealtime behaviors of children with typical development and children with an ASD. Researchers found that feeding issues arise early for children with an ASD, and parental concerns about their child's eating behaviors increased significantly after age one. Behaviors of children with an ASD included: being a picky eater, mouthing nonfood items, resisting new foods, limiting foods based on textures, and having gagging problems during mealtimes (Provost et al., 2010). Martins et al. (2008) conducted a similar study and found that children with an ASD demonstrated higher frequencies of food avoidance and picky eating behaviors, but did not differ from typically developing children in types of eating and feeding difficulties. The researchers concluded higher frequencies of problematic eating behaviors may have been due to difficulty with adaptation to change (Martins et al., 2008). Problematic eating behaviors are common in children with an ASD and present concerns for healthy growth and development.

Children with sensory processing difficulties may also demonstrate problematic eating behaviors. Recent research has been conducted associating sensory processing and tactile sensitivity to eating behaviors in children with an ASD (Bennetto et al., 2007; Cermak et al., 2010; Paterson & Peck, 2011). Significantly elevated levels of sensory symptoms were found in children with autism, when compared to both typically developing children and children with delayed development (Rogers, Hepburn, &

Wehner, 2003). Paterson and Peck (2011) found that 71% of children with an ASD demonstrated sensory processing difficulties with specific problems related to auditory filtering and tactile sensitivity. Children with an ASD experienced problems in mealtime behaviors related to vision, taste, and smell during their daily routines (Paterson & Peck, 2011). Bennetto et al. (2007) studied factors of taste and smell and found that children with an ASD were less accurate during identification of sour and bitter tastes, but no differences were found during identification of sweet and salty tastes. Identification through smell was significantly worse among participants with an ASD (Bennetto et al., 2007). Sensory processing influences a child with ASDs ability to participate in the occupations of feeding and/or eating.

Other diagnoses associated with problematic eating behaviors are developmental disabilities and gastrointestinal disorders, including gastroesophageal problems. Schwarz, Corredor, Fisher-Medina, Cohen, and Robinowitz (2001) conducted research related to feeding disorders in children with developmental disorders and found that 56% of the participants were diagnosed with gastroesophageal reflux (with or without aspiration) and 26% experienced abnormal swallowing kinetics during the oral and/or pharyngeal phases of swallowing. Rommel et al. (2003) also discovered that gastroesophageal reflux was the most frequent medical condition linked to feeding problems in 700 infants and young children. Another diagnosis of childhood feeding behaviors is PDD. Kerwin et al. (2005) determined that parents of children with PDD reported their child demonstrated unusual eating habits such as food selectivity, cravings for certain foods, and strong dislikes of certain foods. Also, 17% of the participants experienced symptoms of gastroesophageal

reflux, such as vomiting. (Kerwin et al., 2005) These childhood diagnoses are common amongst children who demonstrate problematic eating behaviors.

An additional association of problematic eating behaviors and children is sensory sensitivities. Children with sensory sensitivities often experience issues during mealtimes. Smith, Roux, Naidoo, and Venter (2005) conducted a research study based on mothers' perception of their child's eating behaviors. Researchers found that mothers of tactile defensive children reported more problems during feeding their children, in comparison to the control group. Also, tactile defensive children ate limited choices of foods, seldom ate food that was served to the rest of the family, and seldom ate food that touched other food on the plate (Smith et al., 2005). One specific population of children that experience delay of self-feeding skill development is pre-term infants. Dodrill et al. (2004) found that low-risk pre-term infants are at risk for alterations in oral sensitivity, facial defensiveness, and delayed feeding development until approximately 11 to 17 months corrected age. A preterm infant lacks meeting developmental milestones, which leads to weak and immature jaw movements during biting and chewing, less active lip cleaning, more tongue protrusion which leads to loss of food, poor coordination during sucking, swallowing, and breathing, delayed transition to drinking from a cup, and prolonged duration of mealtimes, which in turn influences the development of self-feeding skills (Dodrill et al., 2004). Children can experience sensory sensitivities, which may contribute to problematic eating behaviors.

Sensory Processing

As the literature suggests, pediatric feeding disorders are multifaceted and complex. Angell (2010) proposed a new category of avoidant and restrictive eating to be

added to the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-V). As a result, the newest edition of the DSM-V (2013) includes a category titled, “Avoidant/Restrictive Food Intake Disorder (American Psychiatric Association, 2013). One characteristic of this category includes an eating or feeding disturbance (may be displayed as avoidance based on sensory characteristics of food), which manifests as persistent failure to meet nutritional and/or energy needs (American Psychiatric Association, 2013). A problematic eating behavior can influence a child’s healthy growth and development.

In Chatoor’s (2009) description of a picky or selective eater, she describes children as having sensory sensitivity to tastes, textures, or smells. She also noted that children may be reluctant to trying new foods and/or may refuse to eat certain foods as part of their sensory sensitivity (Chatoor, 2009). Sensory sensitivity can also be referred to as, “sensory defensiveness,” which relates to a child’s reaction to sensory stimuli (Chatoor, 2009). Sensory defensiveness is part of a child’s sensory processing system and is described as perceiving sensations as dangerous, which may result in a child’s defensive reaction (Morris & Klein, 2000). Children who demonstrate sensory defensiveness during mealtimes may refuse to eat food that looks, feels, tastes, or smells different than what they are familiar with (Morris & Klein, 2000). Sensory sensitivities can influence a child’s problematic eating behaviors.

A systematic review was completed to identify challenges of children and adolescents who have difficulty processing and integrating sensory information. Koenig and Rudney (2010) identified that sensory processing issues are associated with diagnostic conditions, such as fragile X syndrome, Asperger syndrome, ASD, and

attention deficit hyperactivity disorder. From the review of the literature, Koenig and Rudney (2010) determined that children and adolescents who have difficulties processing and integrating sensory information also present deficits in areas such as social participation, play, IADLs, ADLs, and school function. Sensory processing issues can influence a child's occupational participation and performance.

Rogers, Hepburn, and Wehner (2003) used parental report in their research study to examine sensory symptoms in children with different developmental disabilities, such as autism, fragile X syndrome, developmental delays, and typically-developing children. Based on results from this study, children with autism and fragile X syndrome had significantly higher scores related to sensory symptoms compared to other groups of diagnoses (Rogers et al., 2003). In addition, children with autism showed significantly higher scores related to taste and smell sensitivity when compared to other diagnostic groups (Rogers et al., 2003). In contrast to the previous research study, Reynolds and Lane (2008) reviewed literature and case reports to determine sensory over-responsivity in individuals who do not have co-occurring diagnoses. The researchers found preliminary data that supported the idea of sensory over-responsiveness occurring as the sole diagnosis in the provided case reports (Reynolds & Lane, 2008). Sensory defensiveness and sensory over-responsivity may contribute to a child's problematic eating behaviors.

Interventions

Problematic feeding behaviors can be addressed with a variety of interventions and feeding programs to ensure the child is growing and developing appropriately. The intervention types vary and are typically based on the demonstrated problematic feeding

behavior. Many factors are considered including diagnoses and developmental issues when starting an intervention, to reduce problematic feeding behaviors. In-patient interventions and feeding programs are a common form of therapy used to minimize feeding problems in children. Numerous research studies have focused on treatment of pediatric feeding problems by using in-patient behavioral interventions (Foy et al., 1997; Laud et al., 2009; Valdimarsdóttir, Halldórsdóttir, & Sigurdardóttir, 2010) Researchers have also used interdisciplinary feeding programs to determine the impact of intervention on children with problem feeding behaviors (Chamberlin et al., 1991; Laud et al., 2009). Interventions that are best suited for a child based on their individual situation are illustrated in a variety of case study reports (Cooper et al., 1995; Singer, Ambuel, Wade, & Jaffe, 1992). Of the interventions provided to children with problematic feeding behaviors, behavioral-based interventions are one example of interventions that are effective.

Behavioral-Based Interventions

Researchers have expressed concern for children who demonstrate feeding problems due to a result of long-term eating disorders and poor growth and development (Chamberlin et al., 1991). In order to decrease problematic feeding behaviors, researchers focused interventions on behavioral changes to normalize a child's food intake during mealtimes (Chamberlin et al., 1991). Howe and Wang (2013) suggested that behavioral interventions and strategies follow operant learning principles. Examples of behavioral interventions include: systematic meal sessions (Laud et al., 2009), positive reinforcement/praise (Foy et al., 1997), shaping, ignoring (Singer et al., 1992), and

escape extinction (Cooper et al., 1995). A combination of these behavioral techniques may be used during feeding interventions for children with problematic eating behaviors.

The interventions implemented may differ, but many researchers choose to use behavioral methods to reduce problematic feeding behaviors. An example of behavior therapy used to reduce feeding behaviors included systematic meal sessions with behavior protocols that were individualized to each person and included antecedent consequences (Laud et al., 2009). Within this research study, authors found positive outcomes in relation to improvements in feeding behaviors, when compared to admission and discharge data of an interdisciplinary feeding program (Laud et al., 2009). In a case study research design, Valdimarsdóttir et al. (2010) found that behavioral techniques, such as social praise, token reinforcements, non-removal of a fork, and additional material reinforcements, influenced a child's participation in regular meals at school and home. Children also tried 39 of the food types that were originally listed as "non-preferred foods" (Valdimarsdóttir et al., 2010). In an additional case study research design, Cooper et al. (1995) identified four children with chronic and severe feeding problems. The researchers utilized behavioral methods of praise, escape extinction, positive reinforcement, and negative reinforcement and tailored each intervention to the child and his/her needs (Cooper et al., 1995). After participation in the intervention, all four children made improvements while in the inpatient unit; however, families experienced difficulties with continuation of treatment, which yielded a decrease in improvements (Cooper et al., 1995). Behavioral interventions may be one option to aid in reducing problematic eating behaviors.

Interdisciplinary Interventions

Interdisciplinary teams are commonly used when working with the pediatric population. The American Occupational Therapy Association (AOTA) compiled information for use in occupational therapy practice regarding feeding, eating, and swallowing. AOTA identified that occupational therapy practitioner's work collaboratively with family members, caregivers, and other professionals when addressing the topic of feeding, eating, and swallowing (AOTA, 2007). An interdisciplinary team typically consists of an occupational therapist (OT), nutritionist, psychologist, and a speech pathologist (Chamberlin et al., 1991). Additional professions working with the interdisciplinary team may include a social worker, nursing staff, and pediatrician (Singer et al., 1992). Each profession on the interdisciplinary team provides insight into treatment and ideas for potential interventions for the child.

Occupational Therapy Feeding Role

According to the AOTA (2007), feeding, eating, and swallowing are complex activities and one needs to demonstrate coordinated function of the motor, sensory, and cognitive systems to successfully engage in these activities. OTs recognize that feeding, eating, and swallowing issues are complex. OTs are trained to conduct comprehensive evaluations and develop specific interventions to improve occupational performance of every client (AOTA, 2007). Miller et al. (2001) described the roles of interdisciplinary team members when managing pediatric feeding and swallowing disorders. The main focus of an OT on the interdisciplinary team is to assess oral-sensory responses, muscle tone, positioning, and self-feeding skills during clinical assessment (Miller et al., 2001).

OTs have an important role as a member of the interdisciplinary team and contribute to the care of children with problematic feeding behaviors.

A systematic review was conducted to determine interventions that OTs use with children birth to five years of age. Howe and Wang (2013) identified three main goals that OTs have when providing interventions to children. The goals include: “establishing a developmental sequence of self-feeding skills, improving acceptance of a wide variety of foods and textures, and improving oral-motor skills” (Howe & Wang, 2013, pp. 405-406). OTs collaborate with parents/caregivers to ensure effective interaction with the child’s family and support client-centered care (Howe & Wang, 2013). OTs are important members of the feeding team and should be utilized during intervention, especially when sensory integration training is needed (Smith et al., 2005; Angell, 2010). An OT can address many aspects throughout a feeding therapy session, which may include preparing a child’s mouth for the sensory experience, preparing a child’s whole body for the meal, and/or modifying the environment to filter excess sensory input (Angell, 2010). The role of an OT during feeding interventions may vary depending on behaviors of the child or the environment in which therapy occurs; however, OTs are suitable to provide interventions for children who demonstrate problematic eating behaviors.

Assessments

To determine effectiveness of feeding interventions, it is important to find reliable and relevant assessments that measure positive or negative changes in a child’s feeding behaviors. A parent or caregiver is often utilized to complete assessments and parent report measures due to lack of insight and/or old enough age to participate in the assessment. The Children’s Eating Behavior Inventory (CEBI) has been used as a

parent/caregiver report to measure a child's eating and mealtime behaviors (Fraser, Wallis, & St. John, 2004; Greer et al. 2007; Laud et al., 2009). Another method of parent report is through identification of a child's diet or intake of food. To measure the amount/type of food and nutritional content of a child's diet, data collection typically included one 24-hour recall of food consumed by the child (Carruth et al., 2004a). Parental report is beneficial to understand problematic eating behaviors demonstrated by a child during family mealtimes.

For many behavioral interventions, researchers used observation as a method to measure a child's feeding behaviors (Cooper et al., 1995; Greer et al., 2007; Valdimarsdóttir et al., 2010). In addition to observation, parent/caregiver interviews are useful to gather information regarding feeding behaviors, food intake, and perceptions of the parent or caregiver about his/her child's problematic feeding behavior (Carruth et al., 1998; Carruth & Skinner, 2000; Gueron-Sela, Atzaba-Poria, Meiri, & Yerushalmi, 2011). Researchers have also utilized a questionnaire with close-ended questions for parents or caregivers to complete, which determines a child's picky eating behaviors (Carruth et al., 1998). In addition to measuring feeding and eating behaviors, researchers used assessments to measure symptoms related to specific diagnoses, such as the Short Sensory Profile. The Short Sensory Profile is a parent-report measure that documents a child's behaviors associated with abnormal responses to different sensory stimuli (Rogers et al., 2003). Overall, a variety of assessments including parent-report, observation, and interview are useful to gather information relating to a child's problematic eating behaviors.

Parent Training

Parents and caregivers play an important role in their child's feeding and eating behaviors. Parent education programs are identified as a method to promote positive eating behaviors in children. Fraser et al. (2004) evaluated the effectiveness of a single session parent education program in reducing eating and mealtime problems in children. The educational program followed principles of behavioral family intervention and focused on social learning by teaching parents strategies to increase positive interaction with children during mealtimes, as well as reduce inconsistent parenting practices (Fraser et al., 2004). Researchers found a significant improvement in a child's problematic eating and mealtime behaviors after the parents attended the educational program (Fraser et al., 2004). In addition, parental concerns about their child's eating behaviors decreased after completion of the parent educational program (Fraser et al., 2004). An additional educational program focused on parents receiving nutritional education and training on ways to incorporate a variety of foods into their child's diet (Gribble, Falciglia, Davis, & Couch, 2003). Parents were taught about increasing their child's exposure to healthy foods, learning how to present foods without restricting access, using rewards and encouragement, and presenting foods in a "non-pressured" way (Gribble et al., 2003). To ensure skills are transferred from the clinical environment to the home environment, parent training is important during interventions for children with problematic eating behaviors.

Feeding programs that address a child's eating behaviors utilize educational sessions, but could also incorporate a discussion sessions for parents. Angell (2010) identified the importance of integrating parents during feeding interventions for children,

as well as the importance of supporting parents throughout the process. Members of an interdisciplinary team provided educational sessions to parents and discussed topics such as feeding disorders in infants, poor early feeding interactions, oral motor development, nutrition in young children, behavior modification techniques, and suggestions for recipes that appeal to picky eaters (Chamberlin et al., 1991). The discussion and education sessions provided information for parents to utilize at home with their children who demonstrate problematic eating behaviors. Angell (2010) identified a common theme during a literature review that regarded parents and the importance of using parent education, guidance, and involvement during the treatment process of a child's eating behaviors. In order to offer a successful intervention to reduce a child's problematic feeding behaviors, parents and/or caregivers should be involved during the entire process.

Family Impact

Family mealtimes can be stressful when a child demonstrates problematic eating behaviors. Additional stress on a family can impact all members of the family, including parents and siblings. A feeding disorder, such as picky eating or problematic eating, not only affects the child's health and development, but it can also influence the child-parent relationship (Greer et al., 2007). Gueron-Sela et al. (2011) suggested the interaction between children and their parents during mealtimes is a reciprocal process. During mealtime and eating, it is important to have optimal parent-child interactions to limit stress and encourage healthy eating behaviors (Gueron-Sela et al., 2011; Gribble et al., 2003). Conflict between a child's desire for certain foods and the parent's desire to provide quality foods may arise, causing additional stress between the child and parent,

as well as during mealtimes (Carruth et al., 1998). A child's problematic eating behaviors may influence mealtime experiences for numerous individuals.

Parents and caregivers often feel responsible for providing their child with a nutritious and healthy meal. Parents typically pressure a child if they believe he/she is experiencing problematic eating and/or are perceived to be underweight (Galloway et al., 2005). Researchers have found a mother can directly influence fruit and vegetable intake of their child by modeling healthy eating habits and allowing fruits and vegetables to be readily available (Galloway et al., 2005; Carruth & Skinner, 2000). Mothers have rated themselves as picky eaters, which suggests the mothers offer a limited number of foods to their children (Carruth & Skinner, 2000). Additionally, negative feeding interactions can develop among children and mothers when children feel pressured from their mother regarding food intake (Gueron-Sela et al., 2011). Parents and caregivers play an important role in a child's development of feeding behaviors.

Problematic feeding behaviors in children are multifaceted. When considering how to decrease problematic feeding behaviors, it is critical to consider developmental stages of the child, sensory processing deficits, probable diagnoses, and family/child interactions. The goal of this independent study was to analyze a child's problematic eating behaviors and possible outcomes after completion of a routine sensory-based feeding group. Methodology used to guide this pilot study is described in further detail in chapter III.

CHAPTER III

RESEARCH METHODOLOGY

The purpose of this research study was to analyze the effectiveness of a sensory-based intervention on a child's problematic eating behaviors. The Person-Environment-Occupation-Performance (PEOP) model was used as a theoretical basis to guide the study, as well as Winnie Dunn's sensory processing model. The PEOP model is appropriate because it emphasizes the interaction between the child, the environment, and the occupational performance of feeding/eating. The comprehensive interaction of the person, environment, occupation, and performance is imperative to determine the cause of the child's problematic eating behavior. Winnie Dunn's Model of Sensory Processing is appropriate as sensory activities were incorporated to influence a child's problematic eating behaviors.

Research Design

A pretest-posttest design was used to investigate changes in eating behaviors based on parental report. Parents/caregivers of the child participants completed two outcome measures, the Children's Eating Behavior Inventory (CEBI) and the Feeding Intake Form (FIF), prior to and following the sensory-based feeding group. The CEBI outcome measure is located in Appendix C and the FIF is in Appendix D. The child participants completed a routine eight-week intervention to determine change over time, which rationalized the research design as appropriate. This study was reviewed and

approved by the Institutional Review Board at the University of North Dakota (See Appendix E). Prior to the intervention, informed consent was obtained from each parent/caregiver of the child participants. A copy of the informed consent is located in Appendix F.

Sampling

Purposive sampling was used during subject selection. Subjects were recruited by therapy staff at an early intervention center located in the upper Midwest. Subjects must have received transdisciplinary services in the past or receive them presently. Occupational therapists (OT) and/or speech language pathologists (SLP) referred the child and his/her parent/caregiver to participate in a sensory-based feeding group. A group of therapists and educators at the early intervention center routinely invite children to the feeding group. The OT and/or SLP determined if the child met inclusion criteria for the intervention group, based on various problematic eating behaviors. Problematic eating behaviors include: lacking interest in food, eating small meals, eating slowly, lacking willingness to try new foods, accepting a limited number of foods, and limiting intake of vegetables and other specific foods (Dubois et al., 2007).

Inclusion criteria for the study was: children within the age range of 18 months to 5 years, demonstrate a problematic eating behavior(s), and live in or near Grand Forks, ND. Children within this age range are able to watch and imitate others. Children younger than 18 months are typically developing eating behaviors and transitioning from a liquid diet to a solid foods diet. The feeding program requires children to be able to watch and imitate others during the program. Children who are younger than 18 months have not yet developed the skill of imitation, and thus were excluded from the study.

Children older than 5 years of age have already transitioned to a solid food diet and have already developed eating behaviors.

Population

Six children participants met the inclusion criteria for this research study. However, the final sample consisted of 4 participants. Participants were between the ages of 2 to 4 years old and 100% were boys. Two participants dropped out of the study due to unknown reasons.

Locale of the Study

The research study was conducted at an early intervention center in Grand Forks, North Dakota. This location was chosen as experienced OTs and SLPs provide direct therapy to children with diagnoses related to physical disabilities and/or developmental delays. A feeding group has been conducted at this location in the past. The sensory-based feeding group took place in the basement of the facility. Two rooms were used during the intervention portion of the study: one room for sensory activities prior to engagement in the feeding group, and one room for implementation of the feeding group. The room for sensory activities was arranged so that distractions were limited. The room for the feeding group included a large table and booster chairs located around the table, which had the child's picture on each specific chair.

Sensory-Based Feeding Program

A routine eight-week intervention was provided to the child participants who demonstrated problematic eating behaviors. The child participants and their parent/caregiver met for group therapy sessions 1 time per week, which lasted approximately one hour. The children participated in the feeding program with three OTs,

while each parent/caregiver attended educational sessions led by two SLPs to learn about child problematic eating behaviors and potential strategies to overcome them.

Intervention strategies utilized during the feeding program included: systematic desensitization, sensory activity engagement, and consistent routines. Approximately ten foods were introduced during each session and were based on a developmental food continuum.

Instrumentation and Data Collection

The CEBI is a parent-report form that is used to assess eating and mealtime problems of children. It was developed according to a framework based on a transactional and systemic understanding of parent-child relationships. Reliability of the outcome measure was studied and test-retest correlations across a 4 to 6 week interval were 0.87 for the total eating problem score and 0.84 for the percentage of items perceived to be a problem in a group of clinical and normal children (Archer, Rosenbaum, & Streiner, 1991). Validity was also determined and the total eating problem scores were significantly higher for a clinical group than for a non-clinical group, and the proportion of items perceived to be a problem was higher for the clinical group in comparison to the non-clinical group (Archer, Rosenbaum, & Streiner, 1991). The CEBI form consists of 40 items that are rated on a 5-point scale with responses: *never*, *seldom*, *sometimes*, *often*, and *always*. Respondents are also asked whether the behavior assessed in each item is a problem, rated on a 2-point scale with responses: *yes* and *no*. Items are scored using a total eating problem score, which is the sum of the ratings on all items, and on the number of items perceived as a problem, which is the sum of yes responses. Trained OTs provided the CEBI to the parent/caregiver of each child participant, which was completed

prior to the first intervention session as the pretest, and again after the final intervention session as the posttest. To ensure proper administration of the outcome measure, the principal investigators explained the CEBI to the OTs and SLPs who dispersed them to the parents/caregivers.

The FIF is a parent-report form that is a questionnaire regarding demographics and interpretation of mealtime challenges and problematic eating behaviors. The purpose of the outcome measure is to gather general demographic information, as well as the parent/caregiver's perspective of his/her child's problematic eating behaviors. The FIF was developed by members of the therapy staff at the early intervention center and has been used during previous feeding groups. The FIF includes open-ended questions and a checklist of problematic eating behaviors for the parent/caregiver to record which behaviors are representative of their child. The FIF was administered by licensed OTs and/or SLPs to the parent/caregiver of the child participant prior to the first intervention session as the pretest, and again after the final intervention session as the posttest. The therapy staff has utilized this outcome measure in the past, which increases reliability of the outcome measure. Qualitative data was gathered through analysis of the open-ended questions on the FIF.

Data collection also included methods of qualitative research. Observation and weekly field notes were utilized to further understand the child's experience during engagement in the sensory-based feeding intervention, as well as processing and change that occurred throughout the routine 8-week feeding group. Both principal investigators observed participants during each feeding group, and one principal investigator recorded weekly field notes. During observation, the principal investigators examined foods the

children ate, as well as their behaviors during the feeding group. The weekly field notes included sensory activities, types of food, and the participants' response to the experience of engaging in the feeding group. Quantitative and qualitative methods were used to collect data for this study.

Tools for Data Analysis

Quantitative and qualitative data analysis was completed. The Statistical Package for the Social Sciences (SPSS) version 21 was used to calculate quantitative data (SPSS, 2012). A Wilcoxon signed-rank test and descriptive statistics were used to analyze the CEBI. Interpretation of the FIF results included descriptive statistics, as well as qualitative data analysis of the open-ended questions. Additional qualitative methods included interpretation of observation and field notes from each intervention session.

A pretest-posttest research design was utilized during this pilot study. Two outcome measures were chosen for quantitative data results, as well as field notes and observations for qualitative results. Data analysis was completed to determine if the eight-week sensory-based feeding group influenced a child's problematic eating behaviors. The results of the pilot study are provided in Chapter IV.

CHAPTER IV

DATA ANALYSIS

Problematic eating behaviors and mealtime experiences were analyzed using a variety of methods. Quantitative and qualitative data were interpreted to produce results for this study. Outcome measures were used to collect pretest and posttest data for, which included the Children's Eating Behavior Inventory (CEBI) and the Feeding Intake Form (FIF). Qualitative data was interpreted through analysis of weekly observations and field notes. The following represents presentation and interpretation of the data analysis and results.

Presentation of Data

A Wilcoxon signed-rank test was ran to determine the comparison of two related samples by examining the results from the pretest and posttest data of the CEBI. No significant difference was found in the results ($Z = -.535, p > .05$). The pretest results were not significantly different from the posttest results when using the Wilcoxon signed-rank test and the CEBI outcome measure.

Descriptive statistics were used to measure the central tendency by calculating the sum as a frequency in the CEBI pretest and posttest results; this sum is used to determine the total eating score. The total eating score is the sum of the ratings on all items of the likert scale and the number of items perceived as a problem, which is the count of *yes* responses. As shown in Table 1, 50% of the participants experienced a decrease in problematic eating behaviors based on the calculated total eating score.

Table 1

CEBI Total Eating Score

	Pretest	Posttest
Participant 1	111	108
Participant 2	95	101
Participant 3	113	103
Participant 4	120	131

According to experience and knowledge about problematic eating behaviors, the occupational therapists (OTs) that provided the sensory-based feeding group identified specific likert scale items on the CEBI that illustrated significant behavioral problems. Table 2 illustrates the statements identified by the OTs. Descriptive statistics were calculated based on the frequency of *never* and *always* responses on the identified likert scale items of the CEBI. According to the pretest results, 50% of parents reported never for item number 16, which states “my child chokes at mealtimes,” and item number 40, which states “my child’s behavior at meals upsets our other children.” Based on posttest results of the CEBI, 50% of parents reported never for item number 13, which states “my child vomits at mealtimes,” and item number 16, which states “my child chokes at mealtimes.” In addition, 75% of parents reported never on the posttest CEBI item number 40, which states “my child’s behavior at meals upsets our other children.”

Table 2

Significant Items on CEBI

Item	Statement
4	I feed my child if he/she doesn't eat.
5	My child takes more than half an hour to eat his/her meal
7	My child enjoys eating.
10	My child gags at mealtimes.
11	I feel confident my child eats enough.
12	I find our meals stressful.
13	My child vomits at mealtimes.
16	My child chokes at mealtimes.
19	I feel upset when my child doesn't eat.
22	I let my child have snacks between meals if he/she doesn't eat at meals.
26	I get upset when I think about our meals.
28	My child lets food sit in his/her mouth.
30	My child's behavior at meals upsets my spouse.
40	My child's behavior at meals upsets our other children.

On the CEBI, parents also reported whether each item was perceived as a problem, which was indicated by a *yes* or *no* response. Data was determined from these results based on the sum of yes and no responses in both the pretest and posttest, which is illustrated in Table 3. According to these results, 1 out of 4 parents reported an increase in the sum of yes and no responses, which indicated less items perceived as a problem.

Table 3

CEBI Total Problems

	Pretest	Posttest
Participant 1	70	69
Participant 2	80	80
Participant 3	69	68
Participant 4	61	72

Descriptive statistics were also calculated during data analysis of the FIF. The central tendency was measured by determining the mode of parental responses on the checklist items. Based on the results, 50% of parents reported less fighting about food and feeding during mealtimes in the posttest data. In addition, 1 out of 4 parents identified statements that applied to their children during the pretest but did not apply to their children during the posttest, which included: “a child who cries and/or arches at most meals,” and “parent repeatedly reports that the child is difficult for everyone to feed.”

Correlation

The level of significance was determined as $p < .05$ with a null hypothesis of, “there will be no difference between a child’s problematic eating behaviors after participating in a sensory-based feeding group.” The Wilcoxon signed-rank test was completed and a negative value of 0.535 was calculated for the Z score. According to these results, the null hypothesis was retained, suggesting there were no significant differences between the pretest and posttest data.

Interpretation of Data

Data analysis was completed using quantitative and qualitative results. A child's healthy growth and development can be influenced by problematic eating behaviors. Based on results from this pilot study, a child's total eating score on the CEBI decreased after completion of a sensory-based feeding group. These findings are supported by research from the literature review. Other researchers utilized the CEBI as an outcome measure and found a decrease in a child's total eating score (Fraser et al., 2004; Laud et al., 2009; Schreck et al., 2004). With improved total eating scores, a child's growth and development can improve. Schwarz et al. (2001) determined that children with developmental disorders experienced significantly improved energy consumption and nutritional status after participation in a diagnosis-specific treatment of feeding disorders. Foy et al. (1997) also found that completion of an oral feeding program improved a child's caloric intake. Healthy growth and development improved after children with problematic eating behaviors participated in cognitive behavioral treatment, resulting in increased oral intake of solid foods, normalized eating patterns, and weight gain (Singer et al., 1992). Contrary to previously stated results, Drewett, Kasese-Hara, and Wright (2002) found no difference between children who failed to thrive in comparison to a control group, in regards to energy density and foods consumed. A child's problematic eating behavior and participation in a feeding intervention varies depending on many factors, such as diagnosis, age, and type of intervention.

A child's problematic eating behaviors can also impact family dynamics and mealtime experiences. Gueran-Sela et al. (2011) found that maternal worry about their child's feeding disorder may explain negative feeding interactions between the child and

mother, impacting mealtime experiences for the family. From the results of this pilot study, the principal investigators determined through the CEBI results that a sensory-based feeding group for children impacted parental report of decreased perception of problems during mealtimes. To support this conclusion, Fraser et al. (2004) found parental problem scores decreased throughout a significant duration of time while their children participated in a feeding intervention. Also, a significant reduction was found in caregiver stress from admission to discharge after their children participated in an interdisciplinary feeding program (Greer et al., 2007; Laud et al., 2009). Limited research was found in regards to family dynamics and mealtime experiences. In order to provide holistic treatment addressing a child's problematic eating behaviors, family dynamics and mealtime problems should be a focus of future research studies.

Sensory processing can also impact a child with problematic eating behaviors' experience during the occupations of feeding and/or eating. Paterson and Peck (2011) determined children with an autism spectrum disorder who demonstrated problematic eating behaviors also experienced sensory processing difficulties such as vision, taste, and smell sensitivities. Rogers et al. (2003) found that children with autism had greater sensitivities to taste and smell when compared to normal developing children. Principal investigators of this study concluded a routine sensory-based feeding group including sensory activities influenced a child's behaviors during mealtimes. Based on qualitative observations, children adapted to an intervention routine that incorporated sensory activities, which ultimately influenced eating behaviors and mealtime experiences. Limited research has been conducted on data regarding sensory-based interventions and a

child's problematic eating behaviors. However, results from this pilot study indicating sensory-based interventions are useful for further research of this topic.

The results from this pilot study support the use of a sensory-based feeding group to address a child's problematic feeding behaviors. By addressing problematic feeding behaviors, parents and/or caregivers may experience improved mealtime experiences, as well as less fighting with the child and/or spouse. To contribute to additional research on problematic eating behaviors, recommendations and conclusions are provided in Chapter V.

CHAPTER V

CONCLUSIONS

Upon completion of this pilot study, the principal investigators have identified a summary of the research findings, limitations of the current research study, recommendations for future research, and conclusions of the study.

Summary of Findings

A pretest-posttest research design was utilized to determine the effectiveness of a sensory-based feeding group on children with problematic eating disorders. One of the problems regarding problematic eating behaviors is concerns for a child's healthy growth and development. According to qualitative observations from this research study, children who participated in an eight-week routine sensory-based feeding group made improvements along the food continuum. Healthy growth and development is positively influenced when a child consumes more food. Also according to results from this research study, children who participated in a sensory-based feeding group experienced a decrease in total eating score; as measured by the Children's Eating Behavior Inventory (CEBI) and included parental report of perceived problems. Family dynamics and mealtime routines can be interrupted by a child's problematic eating behaviors (Carruth et al., 1998). The principal investigators determined a sensory-based feeding group improved family dynamics during mealtimes based on parental report from the Feeding Intake Form (FIF). An additional concern for children with problematic eating behaviors is sensory over-responsiveness, which can lead to a limited diet through avoiding

unpleasant tastes, smells, and/or food textures (Reynolds & Lane, 2008). Through qualitative results of session field notes, children became comfortable with a routine that utilized sensory activities, which ultimately influenced participation during the feeding intervention. A sensory-based feeding group can promote change in a child's experience with problematic eating behaviors. Results from participation in the intervention can influence the child's healthy growth and development, family dynamics, and mealtime routines.

Limitations

Being results were based on a pilot research study, there were apparent limitations. Due to a small sample size with narrow demographics, the generalizability of the results was limited. Also, data was obtained through parental report, which posed a threat to internal validity of testing as the parents completed the same outcome measures during the pretest and posttest of the study. Parental report may also be subject to unreliability of an accurate response due to interpretation of the outcome measures (Rogers et al., 2003; Schreck et al., 2004). The content validity of the CEBI posed an additional limitation regarding the extent to which it measured a child's problematic eating behaviors based on the proposed definition. Face validity was a concern with the FIF, as it was not a reasonable method of gathering posttest data. Also, the execution of outcome measures may have caused parents to feel rushed, as they were asked to complete several documents including the outcome measures and additional paperwork.

Recommendations

Based on limitations of this pilot study, recommendations are necessary for further research. To increase the reliability, it is recommended to use a larger sample size

for improved generalizability of the results. The length of the sensory-based intervention could be extended, as the children began adjusting to the routine of the intervention during the last two sessions. Additional intervention sessions would allow children to become comfortable with the routine and increase improvements made related to problematic eating behaviors. It is also recommended to alter the format of both outcome measures. Parents reported difficulty reading the font size on the CEBI and tracking items in relation to the likert scale responses. Also, the FIF was utilized for both the pretest and posttests. The FIF posttest should be formulated so parents are questioned about how the intervention changed their child's problematic eating behaviors. The rigor of qualitative data could be improved by implementing focus groups and interviews of the parents to obtain a better understanding of their perception and feelings of their child's problematic eating behaviors throughout the sensory-based feeding group.

Conclusions

In conclusion, problematic eating behaviors impact a child's growth and development. Family dynamics and mealtime routines can also be influenced. Based on this pilot study, a sensory-based feeding group has the potential to decrease a child's problematic feeding behaviors. Also, mealtime experiences and family dynamics can be improved through parental and child participation in a sensory-based feeding group. Future research studies should incorporate the aforementioned recommendations to increase rigor, reliability, and validity of the study. Additional research is suggested to incorporate parental education with sensory-based feeding group. Results from the current study and additional research would be beneficial to contribute to interventions provided by pediatric occupational therapists.

REFERENCES

- American Occupational Therapy Association. (2007). Specialized knowledge and skills in feeding, eating, and swallowing for occupational therapy practice. *American Journal of Occupational Therapy*, 61(6), 686-700.
- American Psychiatric Association. (2013). Feeding and eating disorder. In *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Angell, A. (2010). Selective eaters and tactile sensitivity: A review of classification and treatment methods that address anxiety and support a child's need for a sense of control. *Infant, Child, & Adolescent Nutrition*, 2(5), 299-303. doi: 10.1177/1941406410382904
- Archer, L. A., Rosenbaum, P. L., & Streiner, D. L. (1991). The children's eating behavior inventory: Reliability and validity results. *Journal of Pediatric Psychology*, 16(5), 629-642.
- Baum, C. M., & Christiansen, C. H. (2005). Person-environment-occupation-performance: An occupation-based framework for practice. In C. H. Christiansen, C. M. Baum, & J. Bass-Haugen (Eds.), *Occupational therapy: Performance*,

participation, and well-being (3rd ed.). (pp. 243-257). Thorofare, NJ: SLACK Inc.

Bennetto, L., Kuschner, E. B., Hyman, S. L. (2007). Olfaction and taste processing in autism. *Biological Psychiatry*, *62*, 1015-1021. doi: 10.1016/j.biopsych.2007.04.019

Birch, L. L. (1998). Development of food acceptance patterns in the first years of life. *Proceedings of the Nutrition Society*, *57*(4), 617-624.

Birch, L. L., & Fisher, J. O. (1998). Development of eating behaviors among children and adolescents. *Pediatrics*, *101*, 539-549.

Butte, N., Cobb, K., Dwyer, J., Graney, L., Heird, W., & Rickard, K. (2004). The start healthy feeding guidelines for infants and toddlers, *Journal of the American Dietetic Association*, *104*(3), 442-454. doi: 10.1016/j.jada.2004.01.027

Carruth, B. R., & Skinner, J. D. (2000). Revisiting the picky eater phenomenon: Neophobic behaviors of young children. *Journal of the American College of Nutrition*, *19*(6), 771-780. doi: 10.1080/07315724.2000.10718077

Carruth, B. R., & Skinner, J. D. (2002). Feeding behaviors and other motor development in healthy children (2 – 24 months). *Journal of the American College of Nutrition*, *21*(2), 88-96. doi: 10.1080/07315724.2002.10719199

Carruth, B. R., Skinner, J., Houck, K., Moran, J., III., Coletta, F., Ott, D. (1998). The phenomenon of “picky eater”: A behavioral marker in eating patterns of toddlers.

Journal of the American College of Nutrition, 17(2), 180-186. doi:
10.1080/07315724.1998.10718744

Carruth, B. R., Ziegler, P. J., Gordon, A., & Barr, S. I. (2004a). Prevalence of picky eaters among infants and toddlers and their caregivers' decisions about offering a new food. *Journal of the American Dietetic Association, Suppl. 1*, 104(1), S57-S64. doi: 10.1016/j.jada.2003.10.024

Carruth, B. R., Ziegler, P. J., Gordon, A., & Hendricks, K. (2004b). Developmental milestones and self-feeding behaviors in infants and toddlers. *Journal of the American Dietetic Association*, 104(1), S51-S56. doi: 10.1016/j.jada.2003.10.019

Cermak, S. A., Curtin, C., & Bandini, L. G. (2010). Food selectivity and sensory sensitivity in children with autism spectrum disorders. *Journal of the American Dietetic Association*, 110(2), 238-246. doi: 10.1016/j.jada.2009.10.032

Chamberlin, J. L., Henry, M. M., Roberts, J. D., Sapsford, A. L., & Courtney, S. E. (1991). An infant and toddler feeding group program. *American Journal of Occupational Therapy*, 45(10), 907-911.

Chatoor, I. (2009). Sensory food aversions in infants and toddlers. In I. Chatoor (Eds.), *Diagnosis and treatment of feeding disorders in infants, toddlers, and young children*, (pp. 44-49). Washington, DC: Zero to Three.

- Chatoor, I., & Macaoay, M. (2008). Feeding development and disorders. In M. M. Haith, & J. B. Benson (Eds.), *Encyclopedia of Infant and Early Childhood Development*. (pp. 524-533). Denver, CO: Elsevier Inc.
- Cole, M. B., & Tufano, R. (2008). Sensory integration and processing. In M. B. Cole, & R. Tufano (Eds.), *Applied theories in occupational therapy: A practical approach* (pp. 229 - 242). Thorofare, NJ: Slack Books Inc.
- Cooke, L., Carnell, S., & Wardle, J. (2006). Food neophobia and mealtime food consumption in 4-5 year old children. *International Journal of Behavioral Nutrition and Physical Activity*, 3(14). doi:10.1186/1479-5868-3-14
- Cooper, L. J., Wacker, D. P., McComas, J. J., Brown, K., Peck, S. M., Richman, D., Millard, T. (1995). Use of component analyses to identify active variables in treatment packages for children with feeding disorders. *Journal of Applied Behavior Analysis*, 28(2), 139-153.
- Crist, W., & Napier-Phillips, A. (2001). Mealtime behaviors of young children: A comparison of normative and clinical data. *Developmental and Behavioral Pediatrics*, 22(5), 279-286.
- Dodrill, P., McMahon, S., Ward, E., Weir, K., Donovan, T., & Riddle, B. (2004). Long-term oral sensitivity and feeding skills of low-risk pre-term infants, *Early Human Development*, 76, 23-37. doi: 10.1016/j.earlhumdev.2003.10.001

- Drewett, R. F., Kasese-Hara, M., & Wright, C. (2002). Feeding behavior in young children who fail to thrive, *Appetite*, 40, 55-60. doi: 10.1016/S0195-6663(02)00144-7
- Dubois, L., Farmer, A., Girard, M., Peterson, K., & Tatone-Tokuda, F. (2007). Problem eating behaviors related to social factors and body weight in preschool children: A longitudinal study. *International Journal of Behavioral Nutrition and Physical Activity*, 4(9). doi:10.1186/1479-5868-4-9
- Dunn, W. (1997). The impact of sensory processing abilities on the daily lives of young children and families: A conceptual model. *Infants and Young Children*, 9(4), 23-25.
- Dunn, W. (2001). The sensations of everyday life: Empirical, theoretical, and pragmatic considerations, 2001 Eleanor Clarke Slagle Lecture. *American Journal of Occupational Therapy*, 55(6), 608-620.
- Emond, A., Emmett, P., Steer, C., & Golding, J. (2010). Feeding symptoms, dietary patterns, and growth in young children with autism spectrum disorders. *Pediatrics*, 126(2), e336-e343. doi: 10.1542/peds.2009-239
- Esparó, G., Canals, J., Jané, C., Ballespí, S., Viñas, F., & Domenèch, E. (2004). Feeding problems in nursing children: Prevalence and psychosocial factors. *Acta Paediatrica*, 93, 663-668. doi: 10.1080/08035250410029308

- Fallon, A. E., Rozin, P., & Pliner, P. (1984). The child's conception of food: The development of food rejections with special references to disgust and contamination sensitivity. *Child Development, 55*, 566-575.
- Field, D., Garland, M., & Williams, K. (2003). Correlates of specific childhood feeding problems. *Journal of Paediatrics & Child Health, 39*(4), 299-304. doi: 10.1046/j.1440-1754.2003.00151.x
- Foy, T., Czyzewski, D., Phillips, S., Ligon, B., Baldwin, J., & Kish, W. (1997). Treatment of severe feeding refusal in infants and toddlers. *Infants & Young Children, 9*(3), 26-35.
- Fraser, K., Wallis, M., & St. John, W. (2004). Improving children's problem eating and mealtime behaviours: An evaluative study of a single session parent education programme. *Health Education Journal, 63*(3), 229-241.
- Galloway, A. T., Fiorito, L., Lee, Y., & Birch, L. L. (2005). Parental pressure, dietary patterns, and weight status among girls who are "picky eaters." *Journal of the American Dietetic Association, 105*(4), 541-548. doi: 10.1016/j.jada.2005.01.029
- Girolami, P. A., Boscoe, J. H., & Roscoe, N. (2007). Decreasing expulsions by a child with a feeding disorder: Using a brush to present and re-present food. *Journal of Applied Behavior Analysis, 40*(4), 749-753. doi: 10.1901/jaba.2007.749-753
- Greer, A. J., Gulotta, C. S., Masler, E. A., & Laud, R. B. (2007). Caregiver stress and outcomes of children with pediatric feeding disorders treated in an intensive

interdisciplinary program. *Journal of Pediatric Psychology*, 33(6), 612-620. doi: 10.1093/jpepsy/jsml16

Gribble, L. S., Falciglia, G., Davis, A. M., & Couch, S. C. (2003). A curriculum based on social learning theory emphasizing fruit exposure and positive parent child-feeding strategies: A pilot study. *Journal of the American Dietetic Association*, 103(1), 100-103. doi: 10.1053/jada.2003.50011

Gueron-Sela, N., Atzaba-Poria, N., Meiri, G., & Yerushalmi, B. (2011). Maternal worries about child underweight mediate and moderate the relationship between child feeding disorders and mother-child feeding interactions. *Journal of Pediatric Psychology*, 36(7), 827-836. doi: 10.1093/jpepsy/js001

Harris, G. (2008). Development of taste and food preferences in children. *Clinical Nutrition and Metabolic Care*, 11(3), 315-319. doi:10.1097/MCO.0b013e3282f9e228

Howe, T.-H., & Wang T.-N. (2013). Systematic review of interventions used in or relevant to occupational therapy for children with feeding difficulties ages birth-5 years. *American Journal of Occupational Therapy*, 67(4), 405-412. doi: 10.5014/ajot.2013.004564

Kerwin, M. E., Eicher, P. S., & Gelsinger, J. (2005). Parental report of eating problems and gastrointestinal symptoms in children with pervasive developmental disorders, *Children's Health Care*, 34(3), 221-234.

- Koenig, K. P., & Rudney, S. G. (2010). Performance challenges for children and adolescents with difficulty processing and integrating sensory information: A systematic review. *American Journal of Occupational Therapy, 64*(3), 430-442. doi: 10.5014/ajot.2010.09073
- Laud, R. B., Girolami, P. A., Boscoe, J. H., & Gulotta, C. S. (2009). Treatment outcomes for severe feeding problems in children with autism spectrum disorder. *Behavior Modification, 33*(5), 520-536. doi: 10.1177/0145445509346729
- Lewinsohn, P. M., Holm-Denoma, J. M., Gau, J. M., Joiner Jr., J. M., Striegel-Moore, R. Bear, P., & Lamoureux, B. (2005). Problematic eating and feeding behaviors of 36-month-old children. *International Journal of Eating Disorders, 38*(3), 208-219. doi: 10.1002/eat.20175
- Martins, Y., Young, R. L., & Robson, D. C. (2008). Feeding and eating behaviors in children with autism and typically developing children. *Journal of Autism and Developmental Disorders, 38*, 1878-1887. doi: 10.1007/s10803-008-0583-
- Miller, C. K., Burklow, K. A., Santoro, K., Kirby, E., Mason, D., & Rudolph, C. D. (2001). An interdisciplinary team approach to the management of pediatric feeding and swallowing disorders. *Children's Health Care, 30*(3), 201-218.
- Morris, S. E., & Klein, M. D. (2000). Factors that limit oral motor skills. In S. E. Morris, & M. D. Klein (Eds.), *Pre-feeding skills: A comprehensive resource for mealtime development* (2nd Ed.). (pp. 121-137). Tucson, AZ: Therapy Skill Builders.

- Motion, S., Northstone, K., Emond, A., & the ALSPAC Study Team. (2001). Persistent early feeding difficulties and subsequent growth and developmental outcomes. *Ambulatory Child Health, 7*(3/4), 231-237.
- Paterson, H., & Peck, K. (2011). Sensory processing ability and eating behaviour in children with autism. *Journal of Human Nutrition and Dietetics, 24*, 277-310.
- Powell, F. C., Farrow, C. V., & Meyer, C. (2011). Food avoidance in children. The influence of maternal feeding practices and behaviours. *Appetite, 57*, 683-692. doi: 10.1016/j.appet.2011.08.011
- Provost, B., Crowe, T. K., Osbourn, P. L., McClain, C., & Skipper, B. J. (2010). Mealtime behaviors of preschool children: Comparison of children with autism spectrum disorder and children with typical development. *Physical & Occupational Therapy in Pediatrics, 30*(3), 220-233. doi: 10.3109/01942631003757669
- Reynolds, S., & Lane, S. J. (2008). Diagnostic validity of sensory over-responsivity: A review of the literature and case reports. *Journal of Autism and Developmental Disorders, 38*, 516-529. doi: 10.1007/s10803-007-0418-9.
- Rogers, S. J., Hepburn, S., & Wehner, E. (2003). Parent reports of sensory symptoms in toddlers with autism and those with other developmental disorders. *Journal of Autism and Developmental Disorders, 33*(6), 631-642.

- Rommel, N., De Meyer, A.-M., Feenstra, L., & Veereman-Wauters, G. (2003). The complexity of feeding problems in 700 infants and young children presenting to a tertiary care institution. *Journal of Pediatric Gastroenterology and Nutrition*, 37(1), 75-84.
- Ross, E. S., & Browne, J. V. (2002). Developmental progression of feeding skills: An approach to supporting feeding in preterm infants. *Seminars in Neonatology*, 7(6), 469-475. doi: 10.1053/siny.2002.0152
- Schreck, K. A., Williams, K., & Smith, A. F. (2004). A comparison of eating behaviors between children with and without autism. *Journal of Autism and Developmental Disorders*, 34(4), 433-438.
- Schwarz, S. M., Corredor, J., Fisher-Medina, J., Cohen, J., & Rabinowitz, S. (2001). Diagnosis and treatment of feeding disorders in children with developmental disabilities, *Pediatrics*, 108(3), 671-676.
- Singer, L. T., Ambuel, B., Wade, S., & Jaffe, A. C. (1992). Cognitive-Behavioral treatment of health-impairing food phobias in children. *Journal of the American Academy of Child and Adolescent Psychiatry*, 31(5), 847-852.
- Skinner, J. D., Carruth, B. R., Bounds, W., & Ziegler, P. J. (2002). Children's food preferences: A longitudinal analysis. *Journal of the American Dietetic Association*, 102(11), 1638-1647.

Smith, A. M., Roux, S., Naidoo, R. N. T., & Venter, D. J. L. (2005). Food choices of tactile defensive children. *Nutrition, 21*, 14-19. doi: 10.1016/j.nut.2004.09.004

Statistical Package for the Social Sciences. (2012). Version 21.1 [Computer software]. SPSS, Inc.

Valdimarsdóttir, H., Halldórsdóttir, L. Y., & Sigurdardóttir, Z. G. (2010). Increasing the variety of foods consumed by a picky eater: Generalization of effects across caregivers and settings. *Journal of Applied Behavior Analysis, 43*(1), 101-105. doi: 10.1901/jaba.2010.43-101

Williams, K. E., Field, D. G., Seiverling, L. (2010). Food refusal in children: A review of the literature. *Research in Developmental Disabilities, 31*, 625-633. doi: 10.1016/j.ridd.2010.01.001

APPENDICES

Appendix A

Letter of Permission - Early Intervention Center CEO

Appendix B

Letter of Permission - Early Intervention Center Staff

Appendix C

Outcome Measure - Children's Eating Behavior Inventory (CEBI)

Appendix D

Outcome Measure - Feeding Intake Form (FIF)

Appendix E

Institutional Review Board Approval from the University of North Dakota

Appendix F

Informed Consent