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FEEDING DIFFICULTIES IN YOUNG CHILDREN WITH AND WITHOUT AUTISM

By

Ashley N Pugh
B.S., Murray State University, 2007

A Thesis
Submitted to the Faculty of the
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School of Medicine
University of Louisville
Louisville, KY

May 2009

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A Thesis Approved on

April 8, 2009

By the following Thesis Committee:

Thesis Director

DEDICATION

This thesis is dedicated to the children from the
Systematic Treatment for Autism and Related Disorders (STAR) program
for the unforgettable impression they have made on me and so many others.

ACKNOWLEDGEMENTS

I would like to extend my sincere appreciation to my professor and primary advisor, Dr. Pat Blackwell, for her guidance and dedication over the past two years. Her shared expertise in the areas of autism and pediatric feeding has greatly contributed to this study. I would also like to thank my committee members Dr. Jim Scheetz, Dr. Rhonda Mattingly, and Dr. Melanie G. Masters for their knowledge, commitment, and assistance throughout this project. I extend my thanks to the staff at the Weisskopf Child Evaluation Center for their assistance in ensuring a successful research study. I especially express my gratitude to speech-language pathologists, Jenny Burton and Dave Emerich, for their endless support and flexibility throughout this course. Finally, I would like to thank my parents, Durand and Melody, for giving me endless encouragement and providing valuable educational opportunities.

ABSTRACT

FEEDING DIFFICULTIES IN YOUNG CHILDREN WITH AND WITHOUT AUTISM

Ashley N Pugh

April 10, 2009

Although not a criteria for diagnosis of autism, feeding difficulties are commonly found in this population. The purpose of this thesis is to provide further insight in the area of autism and feeding.

Parents of children with and without autism were recruited from the Weisskopf Child Evaluation Center and from their home. Participants were asked to complete a series of questionnaires regarding their child's eating habits. Results found parents of both groups indicated their child exhibits oral sensory processing differences, with the autism group indicating additional sensory differences across a range of categories. Results also found parents expressed concerns for their child's eating habits and appeared interested in seeking feeding therapy at some point in the future.

Research in the area of autism and feeding is limited, although the prevalence of feeding difficulties in this population is high. This study was the first to compare feeding difficulties of children with autism to typically developing children with feeding problems. Further study in this area is imperative to help clinicians better understand and develop the most appropriate intervention for pediatric feeding difficulties.

TABLE OF CONTENTS

	PAGE
DEDICATION.....	iii
ACKNOWLEDEGMENTS.....	iv
ABSTRACT.....	v
LIST OF TABLES.....	vii
CHAPTER	
I. INTRODUCTION.....	1
II. LITERATURE REVIEW.....	13
III. METHODS.....	25
IV. RESULTS.....	32
V. DISCUSSION.....	50
REFERENCES.....	57
APPENDICES.....	64
INSTITUTIONAL REVIEW BOARDS APPROVAL.....	74
CURRICULUM VITAE.....	81

LIST OF TABLES

TABLE	PAGE
1. Relationship of Cognition to Diets in Children with Autism.....	33
2. Food Inventory Differences.....	36
3. Food Inventory Summary of Items Accepted.....	37
4. Food Inventory Summary of Items Refused.....	37
5. Sensory Profile Factor Summary Results.....	39
6. Sensory Profile Section Summary Results.....	41
7. Oral Sensory Processing Item Results.....	43
8. Oral Sensory Processing Questions for Toddlers.....	44
9. Eating Habits Questionnaire: Parent Considerations for Therapy.....	45
10. Eating Habits Questionnaire Differences between Autism & Control Groups.....	46
11. Eating Habits Questionnaire Summary.....	49

CHAPTER I: INTRODUCTION

AUTISM

Autism is a complex neurological condition falling under the broad category, pervasive developmental disorders (PDD), also known as autism spectrum disorders (ASD). This term encompasses a diverse spectrum including autistic disorder, Rett's disorder, childhood disintegrative disorder, Asperger's disorder, and pervasive developmental disorders not otherwise specified (PDD-NOS). For a diagnosis of any one of these, a child must exhibit a "triad of impairments" in their social communication, social interaction, and imaginative understanding (Bowers, 2002).

The Individuals with Disabilities Education Improvement Act of 2004 retrieved from the American Speech and Hearing Association [ASHA], (2006) defines autism as the following:

a developmental disability significantly affecting verbal and nonverbal communication and social interaction, generally evident before age 3, which adversely affects a child's educational performance. Other characteristics often associated with autism are engagement in repetitive activities and stereotyped movements, resistance to environmental change or change in daily routines, and unusual responses to sensory experiences (p.5).

Rapin & Tuchman (2008) have described autism as a "behaviorally distinct syndrome with many known and unknown causes (p.1129)." Key symptoms may be explicit in toddlers and preschoolers and continue throughout life, although the severity

of symptoms often decreases (Rapin & Tuchman, 2008). These researchers further explain autism is a syndrome attributed to abnormal development of the brain.

Diagnostic Criteria

Diagnostic criteria for autism include delays and/or abnormal functioning in the areas of social interaction, language as social communication, and/or symbolic play (American Psychiatric Association [APA], 2000). Children with autism may demonstrate a lack of skills with the following: eye contact, shared enjoyment, use of gestures, and speech. These children also exhibit repetition of speech and activities and demonstrate a preference for being alone (Johnson, Myers, & the Council of Children with Disabilities [CCD], 2007).

The earliest research on autism originated in 1943 from the works of Leo Kanner and Hans Asperger (Kanner, 1943; Kanner & Eisenberg, 1956; Lyons & Fitzgerald, 2007; Pearce, 2005). These researchers described children who exhibited autistic-like characteristics, including limited to no speech, impairments in social interaction, and unusual stereotypical play and movements. Since that time, the diagnostic labels and the criteria have changed to include more specific characteristics (Johnson, et al., 2007). The following diagnostic criteria for autistic disorder were constructed by the APA (2000):

Six or more items from the following categories must be exhibited: qualitative impairment in social interaction marked by two of the following: (a) impairment in the use of multiple nonverbal behaviors, (b) failure to develop peer relationships to developmental level, (c) lack of spontaneous seeking to share enjoyment, interests, or achievement with other people, (d) lack of social or emotional reciprocity; qualitative impairment in communication marked by one of the following: (a) delay or lack of spoken language, (b) marked impairment in the ability to initiate or sustain a conversation, (c) stereotyped and repetitive use of language or idiosyncratic language (d) lack of varied, spontaneous make-believe play; and restrictive, repetitive, and stereotyped patterns of behavior, interests, and activities marked by one of the following: (a) preoccupation with

stereotyped or restricted patterns of interest abnormal in intensity or focus, (b) inflexible adherence to specific, nonfunctional routines or rituals, (c) stereotyped and repetitive motor mannerisms, (d) persistent preoccupation with parts or objects (p. 59-61).

For the purpose of this review, the term autism will be used to refer to this disorder. It should be noted some researchers have used the term ASD to indicate various intensities of autism, as well as various disorders on the spectrum.

Prevalence

The prevalence of autism has dramatically increased, as it was previously believed to exist in 4 to 5 per 10,000 children (Center for Disease Control and Prevention [CDC], 2007). In 2004, the prevalence of 1 in 166 children resulted in the CDC and the American Academy of Pediatrics (AAP) issuing an Autism A.L.A.R.M. to alert the public of this widespread condition (CDC, 2007). Currently, autism is found in 1 of 150 children and is the fastest growing developmental disorder in the United States (Autism and Developmental Disabilities Monitoring [ADDM] from the CDC, (2007).

Based on the prevalence rate of 2007, it is estimated that out of approximately 4 million children born every year in the United States, 560,000 individuals from birth to 21 years are currently affected with an autism spectrum disorder (CDC, 2007). Autism is also 3 to 5 times more likely to occur in males than females and is more prevalent than other common pediatric diagnoses including Down syndrome and childhood cancer (National Center on Birth Defects and Developmental Disabilities, 1999; Gloeker & Percy, 1995). Despite the rising number of diagnoses, no single cause has been identified, leaving professionals mystified.

Etiology and Increasing Incidence

Researchers continue to search for an underlying cause which could explain this complex disorder. Speculations of pre-disposing genetic and environmental factors have been made. A causal relationship between autism and specific syndromes, including fragile X syndrome, tuberous sclerosis, fetal alcohol syndrome, Angelman syndrome, Rett syndrome, and Smith-Lemli-Opitz syndrome have been considered (Johnson, et al., 2007). Other genetic and environmental considerations have included heavy metals, toxins, and xenobiotics, which are thought to cause encephalopathy (i.e. brain damage) (Deth, R., Muratore, C., Benzecry, J., Power-Charnitsky, V., Waly, M., 2007; Muhle, Trentacoste, & Rapin, 2004). As autism is a neurologically based disorder, specific abnormalities in the physiology of brain tissue have been found including “reduced Purkinje cells in the cerebellum, abnormalities to the limbic system, brainstem, frontal lobe, and temporal lobe, and developmental changes in cell size” (Johnson et al., 2007, p. 1189).

The rising occurrence in autism cases has also caused much debate among researchers and professionals working with this population. Some propose there is an epidemic of autism among children (Blaxill, 2004). Others would argue the increasing number of cases is due to an increase in the expertise of professionals making diagnoses. Early screenings and increased education of early signs have led to better identification of cases (Coo, et. al, 2008). Rising incidence has also caused professionals to consider the changes made to the diagnostic criterion.

Prior to 1990, children with an autism diagnosis did not qualify for special education services under IDEA. These children were initially diagnosed with mental

retardation, learning disabilities, speech impairments, and emotional disturbances (Johnson, et al., 2007). Changes in requirements for special education services may have resulted in young children with autism now qualifying for early intervention services, and older children with autism receiving a diagnostic substitution for a previously labeled condition. A comprehensive review conducted by Wing & Potter (2002), suggested changes to diagnostic standards for autism spectrum disorders could be a contributing factor for how many children now fit within the category of autism. These researchers also proposed increased awareness in both parents and professionals are major contributing factors to the incidence and prevalence of autism.

Early Signs & Symptoms

While it is impossible to prevent the occurrence of autism, professionals are effective in teaching families to recognize early signs and symptoms. Promoting awareness of the importance of early intervention services is crucial to helping these children. Researchers have sought to discover these early characteristics in hopes of leading professionals to make earlier diagnoses and implement earlier intervention services.

Wetherby et al. (1994) conducted a longitudinal study of three groups of 18 children, including a typically developing group, an autism spectrum disorders (ASD) group, and a developmental delays (DD) group. As a follow-up procedure, some children were re-evaluated at 2 years and given the Communication and Symbolic Behavior Scales Developmental Profile. The comparisons of these groups revealed 13 red flags for indicating autism spectrum disorders. Nine of these red flags distinguished the ASD group from the DD group. Wetherby et al. (1994) found the following red flags for ASD:

(1) lack of appropriate gaze; (2) lack of warm, joyful expressions with gaze; (3) lack of sharing enjoyment or interest; (4) lack of response to name; (5) lack of coordination of gaze, facial expression, gesture, and sound; (6) lack of showing; (7) unusual prosody; (8) repetitive movements or posturing of body, arms, hands, or fingers; and (9) repetitive movements with objects (p. 485).

Wetherby et al (1994) also found the following four additional red flags in both the ASD and DD groups: “(1) lack of response to contextual cues; (2) lack of pointing; (3) lack of vocalizations with consonants; and (4) lack of playing with a variety of toys in a conventional manner (p.485).” This study concluded children with autism may be described at a very early age as having difficulty with joint attention, lack of eye contact, lack of smiles, little or no speech, monotone voice, and unusual repetitive movements and/or language.

Early Diagnosis

Autism may be reliably diagnosed as early as 24 months, although initial symptoms may appear in infancy when there are a lack of smiles, facial expressions, and shared enjoyment (Clifford & Dissanayake, 2008; Filipek et al., 1999 from ASHA, 2006). Clifford & Dissanayake (2008) found infants, who were later diagnosed with autism, demonstrated lack of gaze and problems with affect as early as 6 months with symptoms worsening before 2 years. These children developed difficulties with joint attention at 2 years, which suggested earlier signs (i.e. eye contact, affect) led to this lack of joint attention.

Despite early signs of autism which may be evident in infancy, diagnosis is generally much later. A study by Mandell, Novak, & Zubritsky (2005) considered the average ages for disorders on the spectrum. These researchers found the age of diagnosis

of autistic disorder was 3.1 years, pervasive developmental disorders not otherwise specified was 3.9 years, and Asperger's disorder was 7.2 years. Wiggins, Baio, & Rice (2006) found that average age of initial evaluation for children who were later diagnosed with an autism spectrum disorder was 48 months; while the earliest mean age of diagnosis was not until 61 months.

The study by Mandell, et al., (2005) also considered differentiating factors contributing to earlier and later diagnoses of autism, PDD-NOS, and Asperger's Disorder. Factors associated with earlier diagnosis included children with severe language impairments and unusual characteristics such as hand flapping, toe walking, and sustained odd play. Children living in an urban area, who were treated primarily by one physician, tended to be diagnosed before those in more rural areas or those who did not have a primary physician. Wiggins, et al., (2006) also found that a child's severity of autism predicted age of initial evaluation and diagnosis.

Factors associated with later diagnosis included oversensitivity to pain, hearing impairment, poverty, and children living in rural areas who were treated by multiple physicians. The age of onset for symptoms of autism is variable among children, as some present with symptoms that may be recognized in the first months of life (Mandell, et al., 2005). Others may be reaching developmental milestones at a normal progression and suddenly regress in acquired skills, leading to a later diagnosis (NIMH, 2008).

Rogers (2004) described three patterns distinguishing the onset of a diagnosis of autism. The first pattern was described as congenital because the autism symptoms were evident at birth and continued throughout the first year of life. Parents reported early atypical symptoms in their infants including changes in temperament, sleeping and eating

patterns, and motor movements. It should be noted; however, that early symptoms such as these, do not always lead to a diagnosis of autism but may include other developmental and/or neurological disorders. The second pattern described was developmental plateau, which occurred when a child's developmental skills peaked after a period of normal language progression. These children were not reported to lose skills; rather, were unable to gain new skills. This pattern was most often seen during 1 to 2 years of age. The final pattern of autism onset described was regressive, in which there is "a clear developmental loss of previously acquired skills" (p. 140). Studies have found children with autism often show signs of regression before 2 years (Goldberg & Osann, 2003).

Goldberg & Osann (2003) concluded the average ages of regression in children with autism were between 19-21 months. Kobayashi and Murata (1998) from Rogers (2004) considered the age of regression in 55 children who had a diagnosis of autism. Almost 50% were found to have regression between 1 to 2 years, approximately 30% between 2 to 3 years, 15% (all males) after 3 years, and 5% (all females with Rhett syndrome) before 1 year. Along with age, specific behaviors have also been considered to indicate regression in children with autism.

Kurita (1985) reported behaviors most often affected by regression (i.e. speech loss) in this population. Single-word speech and extremely limited vocabulary at the time of regression was evident in a large majority of children with autism (94%). Other regression signs included loss of social skills (90%), language comprehension (50%), and motor skills (10%).

Influence of Intervention

While a diagnosis of autism is grave, successful intervention approaches have given hope to these children and their families. Treatment by pediatricians, speech-language pathologists, occupational therapists, physical therapists, and behavioral therapists, encompass a team which assists in minimizing the severity of autism symptoms. Prognosis for successful intervention is greatly affected by the age of diagnosis. When a child receives intensive therapy at an early age, their likelihood of receiving the maximum benefits of therapeutic intervention is greatly increased (ASHA, 2006).

Factors which have been found to predict further language gains in children with autism include presence of speech and combining words spontaneously, communicatively, and regularly before 5 years of age (Lord & Paul, 1997). According to ASHA (2006), prognosis for language development is much higher in children who begin therapy before 3 years, rather than after 5 years. Professionals feel very strongly about identifying these children for intervention services early and have sought to increase awareness.

Early screenings have been recommended by the American Academy of Pediatrics (AAP) in hopes of leading to earlier diagnosis and intervention. Currently, the AAP recommends children be screened for autism by their pediatrician at 9 months, 18 months, and again at 24-30 months (Johnson, et al., 2007). The AAP also recommends that intervention services begin upon suspicion of early signs of autism rather than waiting on a formal diagnosis. Along with enhanced prognosis, early diagnosis and intervention services are also beneficial to minimizing costs of treatment. A study by

Jarbrink & Knapp, (2001) found that cost of lifelong services was reduced by 2/3 when treatment was implemented early.

Intervention

Despite the skills targeted, the ultimate therapy goal for children with autism should be to promote self-determination and generalization of skills learned. ASHA (2006) stated “All persons, including individuals with ASD, deserve the ability to have control over their lives and to advocate for the quality of life they deserve” (p. 27) Specific approaches commonly used to treat communication deficits in this population include the Picture Exchange Communication System (PECS) and the Floortime Approach.

PECS was developed in 1985 by Andrew Bondy and Lori Frost to help individuals with severe communication deficits become more efficient in their social interactions (Bondy & Frost, 1994). Although the goal of PECS was not to facilitate speech, children with autism often develop speech quickly following its use (Ganz & Simpson, 2004; Yoder & Stone, 2006). Ganz & Simpson (2004) found children with autism who received PECS training mastered the system very quickly, increased their number of word utterances, increased their syntax abilities, and generalized the skills learned with a variety of adults. Charlop-Christy, M., Carpenter, M., Le, L., LeBlanc, L., & Kellet, K., (2002) also found that following PECS training, these children had an increase in social communication behaviors (i.e. eye contact, joint attention, play) and a decrease in disruptive, problem behaviors.

The floortime model was developed by Stanley Greenspan to facilitate meaningful interactions for children with autism spectrum disorders and other

developmental disabilities (Greenspan & Weider, 2006). Main goals of this approach include following the child's lead and bringing the child into a shared world. Using an approach to follow the child's lead allows for facilitation of social communication skills including joint attention, communicative intent, initiations, and problem-solving.

Additional Problems Associated with Autism

There are frequently concomitant disorders with autism including mental retardation, attention deficit hyperactive disorder, obsessive compulsive disorder, fragile-X syndrome, tuberous sclerosis, seizures, sleeping disorders, and feeding disorders (Kodak & Piazza, 2008; NIMH, 2008; Paul, 2007). It has been found that approximately 40-45% of tuberous sclerosis cases are found in individuals who meet criteria for an autism spectrum disorder (Smalley, 1998). In the autism population, this incidence occurs in approximately 1% to 4% of cases, and approximately 8-14% of autism and seizure disorder cases (Smalley, 1998). Other characteristics and behaviors which commonly co-exist with autism include low muscle tone, oral motor problems, sensory difficulties, anxiety and fears, irritability, agitation, self-injury, and motor or vocal tics, (Evans, D., Canavera, K., Kleinpeter, F., Maccubbin, E., & Taga, K., 2005; Greenspan & Wieder, 2006; Kim, J., Szatmari, P., Bryson, S., Steiner, D., & Wilson, F., 2000; Paul, 2007).

Although the number of diagnoses for both mental retardation (MR) and autism is decreasing, these conditions continue to overlap. Prior to the 1990's the prevalence of autism and MR was reported as high as 90%; while a more current rate was found to be 50% or less (Johnson, et al., 2007). Chakrabarti & Fombonne (2005) indicated the co-occurrence of autism and mental retardation is even lower at 26-29%. Decrease in these

co-existing conditions could be due to improved cognitive testing and clinical awareness of higher functioning autism spectrum disorders (Johnson, et al., 2007).

Sensory difficulties are also often found in children with autism. Even in 1943, Leo Kanner recognized sensory problems in his study of 11 children whom he described as having unusual sensory response (Pearce, 2005). Children with autism may have an overly sensitive response to stimuli or display a lack in sensory response. Johnson, et al., (2007), summarizes these conflicting sensory responses as follows:

They may seem overly sensitive to certain environmental noises but lack response to human voice or they may visually inspect the details of an object but not notice the comings and goings of other people in the room. Others may have oral aversions and/or total-body ‘tactile defensiveness’ to soft touch or hugs yet be insensitive to pain” (p. 1194).

The conflicting sensory responses in children with autism may lead to other difficulties, including problems with feeding. Specific characteristics of a child’s autism including resistance to change, idiosyncratic behaviors, and sensory difficulties may be responsible for the highly restricted diets commonly found in this population (Cornish, 2002; Ledford & Gast, 2006; Schreck & Williams, 2006; Twachtman-Reilly, J., Amaral, S., & Zebrowski, P., 2008). Conditions, such as feeding difficulties, in conjunction with a diagnosis of autism, exacerbate the challenges these children and their families face.

CHAPTER II: LITERATURE REVIEW

FEEDING DIFFICULTIES IN CHILDREN WITH AND WITHOUT AUTISM

The scientific literature in this review presents findings of an associated condition commonly found among children with autism. Although not a criterion for diagnosis, feeding difficulties are common in this population. This review will consider these difficulties; specifically, the prevalence, possible etiologies, types of feeding difficulties, and behaviors exhibited. Children with autism are also compared to typical children and children with other developmental disorders to explore the defining feeding differences within the autism population.

Feeding Disorders Defined

A feeding disorder in infants and children is defined as “persistent failure to eat adequately with significant failure to gain weight or significant loss of weight over at least one month” (APA, 2000, p. 72). This diagnostic criterion also states the feeding problem must begin before 6 years and not be due to a related medical condition (i.e. reflux), a mental disorder, or lack of opportunity for food consumption.

Types of Pediatric Feeding Difficulties

Wolf & Glass (1992) described the differences between feeding disorders and eating disorders. A feeding disorder is a condition developing in infancy or preschool, possibly having a psycho-social component but not be related to body image. In contrast, eating disorders are described to develop in school age or later, have major psycho-social factors, and be strongly related to body image. A child who can not maneuver food to their mouth could also be considered to have a feeding disorder, but were not included in this study. For the purpose of this review, the term feeding difficulties/problems will be used to describe the eating habits in children with and without autism.

Other feeding conditions which often present in the pediatric population include resistance to particular foods and/or food groups. Ernspenger & Stegan-Hanson (2004), described these individuals as resistant eaters because their selective eating habits greatly surpass those who are considered picky eaters. Resistant eaters may exhibit a variety of characteristics including a history of medical complications, physical impairments, sensory integration dysfunction, or be found in specific populations such as children with autism, Down syndrome, or other developmental disorders.

Feeding selectivities may be concerning for parents of children who are resistant eaters. Ernspenger & Stegan-Hanson (2004) suggest that as a child continuously becomes resistant to particular foods, the family eventually conforms to the child's rigid eating patterns, and prepares meals based on what the child will accept. Some children who are resistant eaters may also experience food jags. Food jags are defined as "the insistence on the same food, or the same serving utensils, or even the same setting over long periods of time" (Ernspenger & Stegan-Hanson, 2004, p. 127).

Prevalence

It is not uncommon for typically developing children to exhibit feeding difficulties, although the prevalence of such problems is much higher in children with special needs (Williams, Gibbons, & Schreck, 2005). Previous studies have indicated up to 25% of typically developing children present with feeding difficulties, while the risk in children with special needs may be as high as 80% (Williams et al., 2005). A literature review by Ledford & Gast (2006) compared seven research studies and concluded that restricted diets, food refusals, and/or sensory-based difficulties were present in up to 89% of children with autism.

It is important to consider the initial diagnosis of autism compared to the onset of feeding difficulties within this disorder. Whiteley (2003) examined the developmental, behavioral, and somatic factors in children from the United Kingdom with a diagnosis of autism, Asperger syndrome, and autism spectrum disorders (ASD). Parents reported that the time of symptom onset for their child with an ASD diagnosis was primarily between 16-24 months. These parents also reported more occurrences of infant feeding difficulties such as vomiting, reflux, colic, and failure to feed in the Asperger's group compared to those children diagnosed with autism. By parent report, the Asperger's group also showed significantly lower regression in acquired skills (i.e. language, self-help skills), upon onset of symptoms.

Williams, et al., (2005), examined feeding difficulties in three groups of children including one group with ASD, one group with special needs but without autism, and one group without special needs. It was found that feeding difficulties across all three groups began at 18 months of age or younger and continued more than 24 months. The results of

this study confirm that feeding problems in children with autism may not be short-lived, but may persist and exacerbate other problems. This information is critical for considering intervention approaches to best meet the needs of this population.

Possible Etiologies

Associated with pediatric feeding problems are structural and functional deficits, problems with sensory processing, motivational deficits, and negative parental reinforcement of inappropriate feeding behaviors (Field, Garland, & Williams, 2003). Burklow, K. A., Phelps, A. N., Schultz, J. R., McConnell, K., & Rudolph, C., (1998) examined various underlying factors associated with pediatric feeding difficulties. The following categories were derived by an interdisciplinary feeding team: structural abnormalities, neurological conditions, behavioral issues, cardiorespiratory problems, and metabolic dysfunction (Burklow et al., 1998). After studying 103 children, all who had a history of prematurity (38%) and/or evidence of developmental delay (74%), it was determined behavioral-based feeding problems were more commonly found than other types of feeding difficulties such as structural, cardiorespiratory, and/or metabolic problems.

Rommel, N., De Meyer, A. M., Feenstra, L., & Veereman-Wauters, G., (2003) examined the cause of pediatric feeding problems and the relationship of prematurity to severe feeding difficulties in 700 children under 10 years. It was found that a combination of medical (i.e. gastroesophageal reflux disease, food allergy, infection) and oral (i.e. suck and/or sensory-based) problems were the most common etiology for feeding problems in children. This study also found an association between the age of the child and type (i.e. oral, behavioral, and medical) of feeding problem. Children less than

2 years most often exhibited medical or oral based feeding problems, while children more than 2 years more often exhibited behavioral-based feeding problems.

Rommel, et al., (2003) indicated that infants born before 34 weeks gestation had more oral sensory-based feeding difficulties. Associations for feeding difficulties within this young population included a history of ventilation, aspiration, GERD, and a history of nasogastric tube feedings. This study also concluded that it is more likely for feeding disorders to develop in premature and/or low birth-weight infants.

Various reasons, specifically for the occurrence of feeding difficulties in children with autism, have included resistance to change, perseveration, idiosyncratic behaviors, impulsivity, sensory difficulties, biological food intolerance, communication deficits, and early onset of failure to thrive (Cornish, 2002; Keen, 2008; Ledford & Gast, 2006; Schreck & Williams, 2006). Because these children are limited in their communication abilities, they may be unable to verbally indicate preferred or non-preferred food items. Therefore, they may resort to abnormal feeding behaviors, such as food refusals. Social aspects of feeding difficulties in children with autism were considered in a study by Williams, Dalrymple, & Neal (2000), which found 41% of parents reported their child had different eating behaviors across various settings.

Research by Field, et al., (2003) found feeding difficulties of children diagnosed with autism, Down syndrome, or cerebral palsy was derived from motivational and/or skill-based problems. Motivational/behavioral deficits were more common in the autism group and were associated with unintended parental reinforcement which resulted in food refusals and selectivities by types and textures. In contrast, the children with Down syndrome and cerebral palsy were found to have more skill-based feeding problems,

including oral motor delays and dysphagia, due to their neurological and anatomical abnormalities. Gastro-esophageal reflux was the most common medical association across all three disorders, and was determined to be a high predictor of food refusal across these populations.

Schreck & Williams (2006) found family food preferences accounted for the restricted diets of children with autism spectrum disorders, more than diagnostic characteristics of autism. These researchers recognized the importance of determining if diet restriction was due to a change in the regular family food patterns following a diagnosis of autism. Further studies are needed to determine the distinction between the possibility of the family modeling restrictive food choices from the beginning or changing their food preferences because of their child's rigid eating patterns.

Keen (2008) examined the relationship of unusual feeding difficulties in children with autism to the early onset of failure to thrive. Seven children with autism were studied who exhibited insufficient growth due to severe feeding problems from infancy to 1 year. This study concluded that severe or atypical feeding problems in combination with failure to thrive in infancy could be a prognostic indicator of autism. The study also determined underlying factors for abnormal feeding to include sensory, cognitive, and emotional dysfunctions.

Types of Feeding Difficulties in Children with Autism

Children with autism have been found to have specific types of feeding difficulties including selective diet and food refusal (Field, et al., 2003; Schreck & Williams, 2006). Fox & Joughin (2002) define selective eating as a type of feeding difficulty, commonly found in preschool age children, in which only a narrow range of

foods are consumed. These children are described to be unwilling to accept novel foods, despite normal feeding and swallowing function and normal perception of body image. Selective eaters may begin their narrow eating patterns at a very young age and continue these behaviors for prolonged time periods.

Food refusals; however, are described as behaviors in which a child displays episodic, intermittent, or situational avoidance to certain foods. These refusals have also been described as inconsistent; meaning a child may only refuse a food depending on environmental circumstances. Food refusals often occur during the preschool years, but usually end when a child reaches school-age. Like selective eating; no explanation accounts for this type of feeding difficulty; and there is no abnormal attitude regarding weight and/or body shape (Fox & Joughin, 2002).

Distinction between selective eating and food refusal is made in the range of food in the child's diet. Children with food selectivities accept only a narrow range of foods, while children with food refusals may accept a wide variety of foods despite the number of foods refused. Also unlike selective eating, food refusals may be episodic and dependent on the situation.

Schreck & Williams (2006) found children with autism had a significantly restricted food variety compared to their family food preferences. 72% of parents reported their child accepted a narrow range of foods. Selective diets have been associated with restriction by textures and types of foods (Field et al., 2003); although Schreck & Williams (2006) found parents did not generally report texture as a correlate of their child's dietary restrictions. In addition to a restricted variety of foods accepted, 57% of parents reported food refusals in their children. Primary reasons for these refusals

included food presentation (48.6%), oral-motor problems (23%), specific utensils (13%), and texture sensitivities (6%).

Cornish (1998) reported that the most difficult feeding problems in children with autism were the introduction of new foods and food refusals. Parents in this study reported their child began to refuse foods between 1 to 3 years, most often when changing from mashed to solid foods. Parents also reported a regression in other previously acquired skills upon the onset of these feeding difficulties. More restricted eating patterns were found in the younger children with autism who were less than 5 years of age. These feeding problems appeared to intensify between 2 to 3 years and ease between 6 to 7 years (Cornish, 1998).

Feeding difficulties in children with autism are often categorized as behavioral or sensory based problems. Ledford & Gast, (2006) defined behavioral problems as “aversive eating behaviors including food refusal, gagging, and expulsion of foods with no medical reason” (p. 153). These researches concluded that behavioral difficulties disrupting mealtimes are likely due to the child’s pragmatic deficits. Difficulties in social interactions may result in missed opportunities for the child to learn appropriate mealtime behaviors, and lead them to exhibit food selectivities or refusals. Children with autism also need structure in their schedule, and offer little flexibility for change. A minor alteration to the child’s typical routine, including mealtimes, may cause them severe disturbances and lead to negative behaviors (NIMH, 2008).

Many studies have found limitations in the diets of children with autism, but few have provided research on the possibility of over-eating behaviors. The National Autistic Society [NAS], (2003) reported over-eating behaviors may be caused by physical

abnormalities, sensory difficulties, rigid routines, coping strategies, obsessive behaviors, and abnormal physiology of the brain. Restricted, repetitive, & stereotyped behaviors, interests, or activities are part of the criterion for diagnosis of autism. It is possible that some children may exhibit obsessive behaviors with specific foods leading them to over-eat and possibly gain weight. Problems consuming too little or excessive amounts of foods and liquids can result in food refusals, food selectivities, obsessive behaviors, and abnormal timing of eating (Cornish, 1998; 2002).

Types of Foods Preferred & Refused

Few studies have attempted to provide information for the types of food children with autism prefer and refuse. Schreck & Williams, (2006) found significantly fewer accepted food items in children with autism compared to their family preferences in the categories of fruits, dairy, vegetables, and proteins. Out of all the food categories examined, carbohydrates were the most frequently accepted items. These results were similar to the 2004 study conducted by Schreck, et al., who compared types of foods eaten by children with autism and typically developing children. Starches (carbohydrates) were the most preferred category for both groups, Children in the autism group were also more likely to accept low textured foods, such as purees, and more likely to refuse foods compared to typical peers.

According to Cornish (1998), textures, colors, and brand packaging were all defining factors for whether children with autism showed preference or rejection to various foods. Parents reported their child went through phases of food preferences lasting from 1 week to 6 months that changed without reason. These phases of food

preferences are similar to the food jags which Ernsperger & Stegan-Hanson (2004) described as a common characteristic of children who are resistant eaters.

A study by Ahearn, Castine, Nault, & Green (2001) evaluated food acceptance in children with autism and PDD-NOS and concluded more than half of these children had a low overall acceptance. Starches were the most highly favored items, with little or no other food groups accepted. Because this study was systematic, it is possible that some of the children may have been more willing to accept food if it was presented in a natural environment.

Although it has been confirmed children with autism have a more restricted diet than their families and peers, little information is provided as to the types of foods they more readily accept. More research is needed in this area to establish appropriate feeding interventions and gradually increase the variety of food accepted.

Feeding Difficulties in Autism Compared to Other Populations

Studies have compared feeding difficulties reported in children with autism to typically developing children and children with other diagnoses and found consistent characteristics for children with autism. Schreck, et al., (2004) found children with autism had significantly more feeding problems and a more restricted diet than their typically developing peers.

The systematic study by Ahearn et al. (2001) considered feeding in children diagnosed with autism and PDD-NOS. More than half of children in both groups had significantly lower levels of food acceptance. Food selectivity and/or refusal were found among these children; although, no disruptive behaviors or expulsions were noted.

Williams et al., (2005), found that children diagnosed with special needs, autism spectrum disorders, and typically developing children all preferred starches over other food categories. This study indicated starches may be a highly preferred food among all young children, not a distinguishing preference for children with autism, who have limited food varieties. Unlike the other groups, the children with ASD insisted on use of particular utensils and/or consistent food presentation. In comparison, the selective eaters with special needs exhibited more oral motor delays and food expulsions.

Introduction to Research Study

Feeding difficulties in children with autism are not uncommon, although research in this area is limited. There is need for additional research specifically in the areas of types of feeding problems, types of foods preferred and refused, and effective intervention methods. Inspection of these areas would serve to determine factors which differentiate feeding difficulties in autism from other diagnoses.

Specific populations have been examined for being predisposed to feeding difficulties. These groups include; but are not limited to, mental retardation, Down's syndrome, CHARGE syndrome, cerebral palsy, and autism spectrum disorders (Dobbelsteyn, et al., 2007; Field, et al., 2002; Kuhn & Matson, 2004). Perske, Clifton, McClean, & Stein (1977) reported that approximately 80% of individuals with severe or profound mental retardation also have feeding difficulties.

Munk & Repp (1994) found the following feeding problems in individuals with mental retardation: total food refusals, food type selectivities, food texture selectivities, and a combination of food type and texture selectivities. As previously indicated, it is common for children with autism to also have mental retardation. The overlap in these

conditions warrants further investigation of the association of cognitive deficits to feeding difficulties in children with autism.

The purpose of this study is to expand on previous research and examine feeding difficulties in young children with autism. Factors including types of feeding problems and number of foods refused, as examined by Schreck & Williams (2006), will be considered. In addition, the severity of cognitive deficits in children with autism will be compared to number of foods refused to determine if any relation exist. Children with autism who have feeding difficulties will also be compared to children without autism who have feeding difficulties to consider indications of sensory-based feeding differences. Finally, although children with autism are commonly found to have feeding difficulties; treatment for these difficulties may be a questionable priority. As a final research aim, this study will consider how likely parents are to seek therapy for feeding in their child with autism. The following research questions will be used to examine these factors:

- 1) Does the severity of cognitive deficits relate to the number of foods refused in children with autism?
- 2) Do parents indicate that their child who has feeding difficulties has sensory abilities in the typical performance range, with regard to oral sensations?
- 3) Do parents indicate that their child who has feeding difficulties has sensory abilities in the typical performance range across a variety of sensory categories?
- 4) Do parents consider the feeding characteristics in their child with autism a concern for which they would seek therapeutic intervention?

CHAPTER III: METHODOLOGY

Purpose

The purpose of this study is to consider factors which differentiate the eating habits in children with autism who have feeding difficulties and children without autism who have feeding difficulties. Specifically the following research questions are considered:

- 1) Does the severity of cognitive deficits relate to the number of foods refused in children with autism?
- 2) Do parents indicate that their child who has feeding difficulties has sensory abilities in the typical performance range, with regard to oral sensations?
- 3) Do parents indicate that their child who has feeding difficulties has sensory abilities in the typical performance range across a variety of sensory categories?
- 4) Do parents consider the feeding characteristics in their child with autism a concern for which they would seek therapeutic intervention?

Participants

This study investigated the feeding difficulties in children with and without autism. A total of 26 caregivers of children between the ages of 2.8 and 11 years (n=26; mean age=7.10 years) were recruited to complete a series of questionnaires pertaining to their child's eating habits and sensory responses. This age range was chosen to expand on prior studies (Schreck, et al., 2004 and Schreck & Williams, 2006) and consider the eating habits of younger children with autism. Further details on participants are provided in Appendices E and F.

Participants were divided into two groups: an autism group consisting of 13 children with a diagnosis of autism and 1 with also on the spectrum but with a diagnosis of PDD-NOS, and a control group of children who had feeding difficulties but did not have autism. Children in both groups were divided by age into the following categories: toddler (2 years; n=1), preschool (3-5 years; n=9), early elementary (6-8 years; n=8) and late elementary (9-11 years; n=8). In order to be considered for inclusion, the child's parent and/or their therapist reported the child currently exhibited at least one of the following feeding difficulties: restricted diet due to acceptance of only a narrow range of foods, refusals of particular foods and/or food groups, difficulty accepting new foods, eating the same foods repetitively, problems managing behaviors at meals, and/or exhibiting coughing, choking, or gagging at meals.

Participants were excluded if they were not free of current conditions which could contribute to these feeding difficulties. These conditions included lactose intolerance, gastro-esophageal reflux disease, and long-term history of gastrostomy utilization. In order to avoid any bias that the results of therapy had influenced the child's current eating habits, these participants were not enrolled in a feeding therapy program which exceeded six months. There was an exception with one child who had been in feeding therapy for 1 ½ years. This exception was made to increase the number of participants in the study.

Parents of the children in both groups were primarily recruited from the Weisskopf Child Evaluation Center (WCEC) including a division within this center, the Systematic Treatment of Autism and Related Disorders (STAR). WCEC is an interdisciplinary childhood evaluation center under the Department of Pediatrics at the University of Louisville. This center provides evaluations and treatments to infants and

children who have or who are at risk for developmental disorders, genetic disorders, organic disorders, and learning disabilities. Team based evaluations are conducted by a developmental pediatrician, psychologist, speech-language pathologist, and occupational therapist. Specialized treatment within WCEC includes interventions for children with autism spectrum disorders and counseling for their families under the STAR program.

WCEC also serves infants and children with feeding difficulties through an interdisciplinary feeding team, consisting of a speech-language pathologist, occupational therapist, nutritionist, and psychologist. Although the majority of participants were tested at WCEC, 7 participants in the control group and 1 participant in the autism group were tested in their home. Prior to enrollment, all parents were given a written informed consent explaining the study. The investigators discussed study procedures, including inclusion criteria and informed consent, with all participants.

Materials

In this study, parents of children with and without autism were asked to complete the following forms: Food Inventory, Sensory Profile Caregiver Questionnaire, and the Eating Habits Questionnaire.

The Food Inventory (Appendix A), which was created by the investigator, is a listing of items from the following categories: Meats, Fruits, Vegetables, Dairy, Grains, Snacks, Beverages, and Miscellaneous. Each category included 11 items, with the exception of the Beverage category which included 8 items. Snacks consisted of complex carbohydrates and mostly sweet, chewy textures. Miscellaneous included a variety of items which did not fit within any other category, such as pizza, French fries, peanut butter, cereal, and macaroni and cheese. For each item listed, caregivers indicated

whether their child had been offered the item and willingly accepted it, been offered the item and refused it, or never been offered the item. Scores were obtained for total number of items accepted and total number of items refused in each category. To ensure this inventory would be as comprehensive as possible, parents were also asked to list any other items, not on the inventory, that their child had been presented with and accepted or refused.

The Sensory Profile Caregiver Questionnaire, created by Winnie Dunn, is a judgment based form containing 125 items to describe a child's response to a variety of sensory experiences. The main sections considered include Sensory Processing, Modulation, and Behavioral and Emotional Responses. Parents were asked to indicate the frequency of their child's response to the sensory experience described. The rating scale for each item included Always, Frequently, Occasionally, Seldom, and Never. The Summary Score Sheet summarized the child's raw score totals by Factor Summary and Section Summary. Once raw scores were obtained, the cut scores and classification system were used to describe the child's overall sensory processing abilities for each section.

Based on the parent's response, the child's sensory abilities were described in the range of Typical Performance, Probable Difference, or Definite Difference. The Sensory Profile defines the Typical Performance range as scores at or above the point 1 Standard Deviation (SD) below the mean, the Probable Difference range as scores at or above the point 2 SD below the mean, but lower than 1 SD below the mean, and the Definite Difference range as scores below the point 2 SD below the mean.

The Infant/Toddler Sensory Profile, created by Winnie Dunn, is a caregiver judgment based form for infants and toddlers from birth to 36 months. The assessment examines the following sensory processing systems: General, Auditory, Visual, Tactile, Vestibular, and Oral Sensory Processing. The parent of the toddler participant was asked to rate the frequency of their child's response to the sensory experience described on the scale of Almost Always, Frequently, Occasionally, Seldom, and Almost Never. For children in the toddler range, Quadrant Summary and Sensory Processing scores were obtained. Similar to the Sensory Profile Caregiver Questionnaire, the summary score sheet was used to calculate the child's total raw scores in each section and cut off scores placed the child's sensory abilities in the range of Typical Performance, Probable Difference, or Definite Difference.

The Eating Habits Questionnaire (Appendix B), created by the investigator, is a survey designed to compare differences in the eating habits of children with and without autism who have feeding difficulties. This questionnaire consist of 24 statements considering the nature of the feeding difficulty, specific types of foods preferred and refused, possible reasons leading to the child's eating habits, specific parent concerns, and the willingness of parents to seek feeding therapy. Parents were asked to rate each statement on the 5 point scale of Strongly Disagree, Disagree, Undecided, Agree, or Strongly Agree. The mean response for each item was compared between the autism and control groups, as well as with age.

Procedures:

Parents of both groups completed the Sensory Profile Caregiver Questionnaire. Three children with autism exceeded the recommended age level for this assessment at

11 years; however, could not complete the Sensory Profile Self Questionnaire for Adolescents and Adults due to significant cognitive and communication limitations. The parent of the toddler completed the Infant/Toddler Sensory Profile Questionnaire. In addition, parents of both groups completed the Food Inventory and Eating Habits Questionnaires. Information regarding cognition, adaptive skills, and educational placement were obtained from database files at WCEC for the children with autism.

Statistical Analysis

Descriptive information was utilized to describe the severity of deficits in cognition, adaptive skills, and/or education performance and to make observations concerning indications of cognition related to the number of foods refused. Initially standardized cognitive test results were proposed to determine if a correlation could be made with number of food refusals. However; after the review of records, it was apparent many participants did not have these test results due to the child's inability to complete standardized testing and/or not having a recent standardized cognitive assessment. Therefore, measures of analyzing cognitive functioning were altered to descriptive.

Analysis of the food inventory consisted of utilizing an independent group t-test to determine if there was a statistically significant difference in the items preferred and refused between the autism and control groups. In addition, a one-way analysis of variance (ANOVA) was completed to allow for comparison of items preferred and refused across the age categories of toddler, preschool, early elementary, and late elementary.

For analysis of the Sensory Profile Caregiver Questionnaire, an independent group t-test was completed to determine if there was a significant difference between the

autism and control groups with regard to differences across a range of sensory categories. A one way ANOVA was also completed to compare the differences across a range of sensory categories across the age groups of preschool, early elementary, and late elementary. Descriptive information was also utilized for this instrument with the toddler participant, as well as to clarify trends between study groups and age categories.

For analysis of the Eating Habits Questionnaire, descriptive information was utilized to explain the mean response of caregivers in the control and autism groups and with age. In addition, an independent group t-test was completed to determine if there was a significant difference in responses between groups. A one-way ANOVA was also used to compare the responses across the age categories.

Because there was a limited sample size, subjects for this study were tested as a pilot procedure for possible subsequent expanded studies. Therefore, no power analysis was conducted to determine sample size.

CHAPTER IV: RESULTS

Results are divided into the following sections: Relationship of Cognition to Diets in Children with Autism, Sensory Differences in Children with and without Autism, and Parent Considerations for Feeding Therapy. These sections correlate to the order of proposed research questions.

Relationship of Cognition to Diets in Children with Autism:

Medical files for the autism group were reviewed to determine deficits in cognition, adaptive skills, and/or educational performance. Three children were given a diagnosis of mental disability with an accompanying severity rating. For children who did not have an updated cognitive evaluation, educational placement was reported to indicate the child's cognitive abilities. For the remaining participants, scores from standardized test for cognitive and adaptive skills were combined and classified based on the normal distribution curve (Paul, 2007). Children whose standardized scores were 69 and below were termed severe developmental delay (DD), those with scores of 70 to 76 were termed moderate DD, and those with scores of 77 to 84 were termed mild DD. Children with scores 85 and above were considered within the average range.

The average number of food and beverage refusals in the autism group was 35.93 out of a possible 85 listed items on the Food Inventory. Comparison of refusals to the

description of cognitive, adaptive, and/or educational deficits in the autism group are described in Table 1.

Table 1

Relationship of Cognition to Diets in Children with Autism

Participant	Classification	Total # of Food/Bev Refusals	Age Group
1A	Self-contained classroom*	33	E
2A	Severe to Profound MR	54	L
3A	Severe developmental delay (DD)	41	P
4A	Moderate DD	19	P
5A	Severe DD Full time special education	39	L
6A	Mild Mental Disability	28	L
7A	Severe DD Self-contained classroom*	40	L
9A	Severe DD Self-contained classroom*	52	E
10A	Mild MR	54	P
11A	Moderate DD	24	P
12A	FMD (functional mental disability) classroom *	33	E
13A	ECE (early childhood education) classroom *	25	L
14A	Severe DD	16	P
15A	Self-contained classroom*	45	E

Age Group Codes: P=Preschool E=Early Elementary; L=Late Elementary

* Need for academic assistance beyond what was available in the regular classroom

Refusals above mean

Of the 7 children who had a reported number of food and beverage refusals above mean, 1 had a diagnosis of severe to profound mental retardation, 4 had severe developmental delays and required academic assistance beyond what was available in the regular classroom, 1 had a diagnosis of mild mental retardation, and 1 was enrolled in a self-contained classroom. This group of children was represented by the following age

categories: preschool (n=2), early elementary (n=2), and late elementary (n=3). Age categories were based on chronological age, regardless of school placement.

The results for the remaining 7 children with autism, whose number of food refusals were below the group mean indicated the following: 1 had a diagnosis of mild mental disability, 1 had severe developmental delays, 2 had moderate developmental delays, and 3 needed additional academic assistance in the classroom. This group of children was represented by the age categories of preschool (n=3), early elementary (n=2), and late elementary (n=2). It should be noted the parent of the child falling in the classification of severe developmental delay only identified 35 out of a possible 85 accepted foods and beverages. The remaining 34 were marked as items which had never been offered. Therefore, the parent did not report those items as either accepted or refused. These results indicate the child's limited diet may have influenced the parent to only present items fitting within their rigid eating pattern; thus, reinforcing the child's low acceptance for a variety of foods.

Items Accepted and Refused between the Autism and Control Groups

Differences were noted in the types and number of preferred and refused items between the autism and control groups. These variations should however, be interpreted with the limitation that obvious cognitive differences existed between the groups and could have affected the child's feeding in some way. The control group had normal cognition, unlike the autism group, who had significant developmental delays.

The autism group accepted fewer items and exhibited more refusals than the control group. Out of a possible 85 items, the total number of accepted items in the autism group was 39.76 compared to 46.74 items in the control group. The most accepted

item category in both groups and with age was Snacks. Miscellaneous items (i.e. French fries, pizza, cereal) in the toddler and beverages in the preschool children were also the most accepted categories. Average items accepted increased with age.

As previously stated, the total number of refusals for the autism group was 35.93 compared to 34.67 in the control group. The most refused item category in both groups and with age in the toddler, preschool, and early elementary children were Vegetables. Fruits were the most refused category for the late elementary children. All refusals decreased with age.

Parents in both groups also reported items not on the Food Inventory that their child accepted or refused. These items were not included in the statistical analysis but are listed in Appendix D. Visual inspection of accepted items for the control group found primarily soft texture items including mashed potatoes, mandarin oranges, and cabbage. Conversely, inspection of additional accepted items in the autism group included crunchy/chewy foods such as cheese puffs, raisins, and fish sticks.

The Levene's Test for Equality of Variances was significant indicating unequal variances that the control group accepted more foods and beverages. The independent group t-test for equality of means indicated a significant difference in the total number of beverages between groups. Table 2 describes these computed results.

Table 2

Food Inventory Differences

Item	Levene's Test for Equality of Variances			T-test for Equality of Means		
	Significance	T	Df	Sig (2-tailed)	Mean Difference	Standard Error Difference
Total # of Accepted Beverages	.005*	-3.644	20.628	.002**	-2.417	.663
Total # of Refused Beverages	.068	3.271	24	.003**	2.083	.637
Total # of accepted foods and beverages	.050*	-1.052	19.070	.306	-6.964	6.621

* Equal variances are not assumed between groups

** The mean difference is significant at the 0.05 level between groups

The Beverages section of the Food Inventory included a listing of 8 items. On average the children in the autism group refused 3 of these items; whereas, the children in the control group refused on average, less than one beverage. A one-way ANOVA compared the Food Inventory items with age and found no significant differences. Tables 3 and 4 summarize the average accepted and refused items between groups.

Table 3Food Inventory Summary of Items Accepted

Category	# Items	Autism Group		Control Group	
		Mean	SD	M	SD
Meats	11	6.21	3.662	6.08	3.704
Fruits	11	2.43	2.243	4.58	3.704
Vegetables	11	1.71	2.164	3.83	3.353
Dairy	11	4.43	2.243	5.33	2.387
Grains	11	7.00	3.508	6.25	3.769
Snacks	11	7.79	2.155	7.17	3.010
Beverages	8	4.50	2.139	6.92	1.165
Miscellaneous	11	5.79	2.119	6.58	3.175
Total Accepted	85	39.79	13.302	46.75	19.349

Table 4Food Inventory Summary of Items Refused

Category	# Items	Autism Group		Control Group	
		Mean	SD	M	SD
Meats	11	4.43	3.673	4.50	3.451
Fruits	11	6.57	2.652	5.83	3.589
Vegetables	11	7.21	3.142	6.50	3.344
Dairy	11	4.57	1.910	4.92	3.059
Grains	11	3.57	3.368	4.58	3.655
Snacks	11	2.36	1.865	3.42	2.843
Beverages	8	3.00	1.881	.92	1.240
Miscellaneous	11	4.00	1.881	4.08	2.968
Total Refused	85	35.93	12.621	34.67	18.456

Sensory Differences in Children with and without Autism:

Sensory Profile: Factor Summary Results:

Because there was only one toddler in the study, results from the Infant/Toddler Caregiver Questionnaire were not included in the comparison between groups or age. For remaining participants, the mean indicated differences in the Sensory Profile were analyzed as follows: 1=Typical Performance, 2=Probable Difference, and 3=Definite Difference.

The following factors indicated the most differences in the autism group: Sensory Seeking (M=2.77; SD=.599), Inattention/Distractibility (M=2.69; SD=.630), and Oral Sensory Sensitivity (M=2.54; SD=.776). These areas were also the highest reported differences in the control group but in a different order and degree of difference: Oral Sensory Sensitivity (M=1.91; SD=.831), Sensory Seeking (M=1.64; SD=.674) Inattention/Distractibility (M=1.55; SD=.688). The control group still scored within the typical performance range for all factors; although Oral Sensory Sensitivity was much closer to the probable difference than typical performance range. The autism group; however, had sensory differences across a variety of factors.

The Levene's Test for Equality of Variances was significant indicating unequal variances for Low Endurance/Tone; Poor Registration; Sensory Sensitivity; Sedentary; and Fine Motor/Perceptual. The t-test for equality of means indicated significant differences in the areas of Sensory Seeking; Emotionally Reactive; Inattention/Distractibility; Poor Registration; Sedentary; and Fine Motor, with the autism group indicating more differences in all areas compared to the control group. Table 5 represents the figures for unequal variances and significant mean differences between

both groups. It should be noted that the only factor which did not indicate either unequal variances or significant mean difference between groups was Oral Sensory Sensitivity. A one-way ANOVA found no significant differences in these sensory factors with age.

Table 5
Sensory Profile: Factor Summary Results

Factor Summary Item	Levene's Test for Equality of Variances		T-test for Equality of Means			
	Significance	T	Df	Sig (2-tailed)	Mean Difference	Standard Error Difference
Sensory Seeking	.241	4.359	22	.000**	1.133	.260
Emotionally Reactive	.706	4.020	22	.001**	1.098	.273
Low Endurance/Tone	.026*	1.539	21.314	.139	.497	.332
Oral Sensory	.901	1.916	22	.068	.629	.328
Inattention	.405	4.261	22	.000**	1.147	.269
Poor Registration	.000*	6.501	12.000	.000**	1.385	.213
Sensory Sensitivity	.001*	1.915	16.048	.073	.448	.234
Sedentary	.006*	2.309	20.518	.031**	.741	.321
Fine Motor/Perceptual	.010*	3.544	17.108	.002**	1.028	.290

* Equal variances are not assumed between groups

** The mean difference is significant at the 0.05 level between groups

Sensory Profile: Section Summary Results

The three areas indicating the most differences in the autism group included Oral Sensory Processing (M=2.85; SD=.555), Vestibular Processing (M=2.69; SD=.480), Auditory Processing (M=2.62; SD=.650), Multi-Sensory Processing (M=2.62, SD=.768), and Behavioral Outcomes of Sensory Processing (M=2.62; SD=.768). The highest to indicate differences in the control group were Oral Sensory Processing (M=2.0; SD=.775), Auditory Processing (M=1.55; SD=.688), and Vestibular Processing (M=1.45; SD=.688). These results indicate the autism group showed more differences

across a variety of sensory processing sections; whereas, the control group indicated differences only in Oral Sensory Processing.

The Levene's Test for Equality of Variances was significant indicating unequal variances for Visual Processing; Sensory Processing related to Endurance/Tone; and Items Indicating Threshold for Response. The independent group t-test found significant differences in the mean between groups, with the autism group having more differences in all sections except Sensory Processing Related to Endurance/Tone. Although the autism group still had a higher mean response with this section, significance was not reached. The computed figures for unequal variances and significant differences are represented in Table 6. A one-way ANOVA found no significant differences of these sensory sections with age.

Table 6
Sensory Profile Section Summary Results

Section Summary Items	Levene's Test for Equality of Variances			T-test for Equality of Means		
	Significance	T	Df	Sig (2-tailed)	Mean Difference	Standard Error Difference
Auditory Processing	.636	3.912	22	.001**	1.070	.273
Visual Processing	.000*	2.847	15.08	.012**	.755	.265
Vestibular Processing	.162	5.176	22	.000**	1.238	.239
Touch Processing	.074	3.496	22	.002**	1.112	.318
Multisensory Processing	.193	5.015	22	.000**	1.434	.286
Oral Sensory Processing	.210	3.112	22	.005**	.846	.272
Sensory Processing related to Endurance/Tone	.008*	1.866	20.772	.076	.587	.315
Modulation related to Body Position and Movement	.133	3.104	22	.005**	.958	.309
Modulation of movement affecting activity level	.237	5.927	22	.000**	1.357	.229
Modulation of Sensory Input affecting Emotional Responses	.277	4.290	22	.000**	1.266	.295
Modulation of Visual Input affecting Emotional Responses and Activity Level	.122	5.323	22	.000**	1.266	.238
Emotional/Social Responses	.914	3.051	22	.006**	.804	.264
Behavioral Outcomes of Sensory Processing	.710	3.577	22	.002**	1.161	.325
Items indicating Threshold for Response	.000*	6.189	11.000	.000**	1.417	.229

* Equal variances are not assumed between groups

** The mean difference is significant at the 0.05 level between groups

Sensory Profile: Oral Sensory Processing Items

In order to obtain further insight into the oral-sensory processing for both groups, each question of this section was analyzed. Statements were analyzed by occurrence rates as follows: 1=Always, 2=Frequently, 3=Occasionally, 4=Seldom, and 5=Never. The sensory responses which most frequently occurred in the autism group included: Avoids certain taste or food smells that are typically part of children's diets (M=2.23; SD=1.423), Will only eat certain tastes (M=2.54; SD=1.266), Limits self to particular food textures/temperatures (M=2.38; SD=1.193), Picky eater, especially regarding food textures (M=2.00; SD=1.414), Shows strong preference for certain tastes (M=2.31; SD=1.182), Craves certain foods (M=2.08; SD=1.188), Seeks out certain tastes or smells (M=2.62; SD=1.387), Chews or licks nonfood objects (M=2.54; SD=1.391), and Mouths objects (M=2.62; SD=1.446). Similarly, frequent responses for the control group included: Will only eat certain tastes (M=2.91; SD=1.514) and Picky eater, especially regarding food textures (M=2.36; SD=1.206).

The results from Levene's Test for Equality of Variances found equal variances for all items. The results from the independent group t-test found the autism group had significantly more oral sensory processing differences with the items: Craves certain foods, Chews/licks nonfood objects, and Mouths objects. These differences could be a reflection of the developmental delays in the autism group.

On average, the autism group also indicated more frequent occurrences with all items except "Shows strong preference for certain smells", in which the control group reported more frequent occurrence. These results indicate the autism group reported more oral sensory differences than the control group, specifically with feeding, although

not all areas reached significance. A one-way ANOVA found a significant difference with “Chews or licks nonfood objects” with the preschool children indicating more frequent occurrence than the late-elementary children. Computed values are described in Table 7.

Table 7
Oral Sensory Processing Item Results

Oral Sensory Processing Items	Levene’s Test for Equality of Variances			T-test for Equality of Means		
	Significance	T	Df	Sig (2-tailed)	Mean Difference	Standard Error Difference
Gags easily w/ textures/utensils**	.915	-.242	22	.811	-.161	.664
Avoids certain tastes/smells**	.628	-1.573	22	.130	-.951	.605
Only eats certain tastes**	.591	-.654	22	.520	-.371	.567
Limits to particular textures/temp**	.521	-1.467	22	.157	-.797	.543
Pick eater, especially w/ textures**	.948	-.671	22	.509	-.364	.542
Smells nonfood objects**	.157	-2.059	22	.052	-.916	.445
Preference for certain smells	.157	1.170	22	.254	.566	.484
Preference for certain tastes**	.071	-1.469	22	.156	-.874	.595
Craves certain foods**	.533	-2.201	22	.039*	-1.014	.461
Seeks certain tastes/smells**	.735	-1.609	22	.122	-.930	.578
Chews/licks nonfood objects**	.133	-3.596	22	.002*	-1.825	.508
Mouths objects**	.902	-2.286	22	.032*	-1.294	.566

*The mean difference is significant at the .05 level between groups

**Autism group indicated more frequent occurrence of sensory item described

Significantly more frequent occurrence in preschool children than late elementary

Infant/Toddler Caregiver Questionnaire:

The results from the toddler were all completed with descriptive statistics. Areas which placed the child's scores in the difference ranges were Sensory Sensitivity; Sensation Avoiding and Low Threshold Tactile Processing; Vestibular Processing; and Oral/Sensory Processing. The Oral Sensory Processing questions were also analyzed individually. The results from the questions are listed in Table 8.

Table 8

Oral Sensory Processing Questions for Toddler

n=1 (control group)

Item	Response
My child licks/chews on nonfood objects:	5
My child mouths objects:	5
My child is unaware of food/liquid left on lips:	1
My child refuses all but a few food choices:	3
My child resists having teeth brushed:	4
My child refuses to drink from a cup:	4
My child refuses to try new foods:	1

Response Rating: 1=Almost Always, 2=Frequently, 3=Occasionally,
4=Seldom, 5=Almost Never.

Parent Considerations for Feeding Therapy

Items from the Eating Habits Questionnaire are analyzed in Table 9 with regard to whether parents consider their child's eating habits a concern to seek therapy.

Table 9

Eating Habits Questionnaire: Parent Considerations for Therapy

Item	Autism Group		Control Group	
	Mean	SD	M	SD
Eating is a problem	3.71	1.267	3.42	1.443
Concerned w/ eating	3.79	1.122	3.67	1.557
Therapy needed soon	3.14	1.292	2.75	1.603
Therapy not needed immediately	2.57	1.016	2.17	1.115
Therapy not needed	2.36	.929	2.58	1.564

Mean Response: 1=Strongly Disagree; 2=Disagree, 3=Undecided; 4=Agree; 5=Strongly Agree

Parents of children with and without autism seemed somewhat ambivalent about therapy to assist with greater food acceptance. Their responses indicated agreement with statements that their child's eating was a problem about which they were concerned; however, they also indicated disagreement with the statement that intervention for eating was important and needed soon. They seemed to disagree; however, with a statement that therapy would not be needed at sometime in the future. Considering the research question, these results suggest that parents do consider their child's eating a problem and a concern for which they are interested in intervention, although they may not be ready for intervention immediately.

The Levene's Test for Equality of Variances showed unequal variances with the autism group indicating more agreement for item 3 (Prefers crunchy foods), item 8 (Refuses particular foods/food groups), and item 16 (Concerned about child's eating) and

the control group indicating more agreement with item 12 (Refuses based on prior negative experience) and item 24 (Intervention for child's eating is not needed). The independent group t-test found significant differences with the control group indicating more agreement with item 4 (Prefers smooth foods) and the autism group indicating more agreement with item 18 (Concerned with ability to socialize). Although preference for textures was significantly different between groups, the control group did not show a considerable difference between crunchy (m=3.33) and smooth (m=3.58) foods overall. The computed values for unequal variances and significant differences between the autism and control groups are represented in Table 10.

Table 10

Eating Habits Questionnaire Differences Between Autism and Control Groups

Item	Levene's Test for Equality of Variances		T-test for Equality of Means			
	Significance	T	Df	Sig (2-tailed)	Mean Difference	Standard Error Difference
Prefers crunchy foods ***	.038*	1.628	17.518	.121	.738	.453
Prefers smooth foods	.133	-3.161	24	.004**	-1.583	.501
Refuses foods	.035*	1.038	13.726	.317	.429	.413
Refusals due to prior negative experience	.014*	-1.179	18.571	.253	-.738	.626
Concerned w/ child's eating	.045*	.220	19.670	.828	.119	.540
Concerned w/ social aspects	.150	2.8444	24	.009**	1.464	.515
Therapy not needed	.017*	-.439	17.314	.666	-.226	.515

* Equal variances are not assumed

**The mean differences between groups are significant at the .05 level

***Significant difference with late elementary age children showing more agreement

A one-way ANOVA indicated no significant difference with age to the parent's perceived need for feeding therapy. Age of child did not seem to affect the parent's perception of their child's eating as a problem about which they were concerned. Parents of the younger children in both groups indicated more agreement that feeding intervention was important and needed soon; however, significance with age was not reached. It should be noted, based on results from the food inventory and mean responses from this questionnaire, children in the younger age categories seemed to exhibit more food refusals and have more difficulties accepting new foods.

The one-way ANOVA did determine a significant difference between the preschool and late elementary age children with item 3, (My child prefers foods that are crunchy). Children in the late elementary age category showed more preference for crunchy foods than the preschool children.

Other significant information included description for the type of feeding difficulty, possible causes for these difficulties, and description of caregiver concerns. Based on the mean responses for each question, the results indicated children in both groups had difficulty accepting new foods and exhibited food refusals. Parents indicated they present new foods and beverages to their child and do not only present items they know their child will accept. Therefore, these difficulties are not indicated to be caused by the child's lack of opportunity to expand their diet due to caregiver influenced limitations.

Presentation, color, texture, and prior negative experience with food and beverage items were examined as possible reasons for refusals. Texture and presentation

averaged as the highest possible reasons for refusals in both groups. The control group was more likely to exhibit refusals based on color and a prior negative experience.

When considering the area in which parents felt the most concern for their child's eating habits, nutrition was the highest in both groups, surpassing concerns with socialization and family stress. The autism group did; however, score significantly higher with concerns of socialization. Mean responses and differences for each item between the autism and control groups are listed in Table 11. Appendix C reports the mean response of each item across age categories.

Table 11Eating Habits Questionnaire Summary

Summary of Questionnaire Item	Mean Response	Standard Deviation	Significance of Means
Consider eating a problem	3.71 ; 3.42	1.267 ; 1.443	.581
Few foods accepted	3.36 ; 4.00	1.447 ; 1.128	.224
Prefers crunchy	4.07 ; 3.33	.829 ; 1.371	.121
Prefers smooth	2.00 ; 3.58	1.177 ; 1.379	.004*
Prefers hot	3.29 ; 3.42	.994 ; .996	.741
Prefers cold	2.57 ; 3.00	1.158 ; 1.044	.335
Problem accepting new foods	4.14 ; 4.25	.864 ; 1.215	.796
Refuses foods	4.43 ; 4.00	.514 ; 1.348	.317
Refuses due to presentation	3.93 ; 3.50	1.141 ; 1.087	.339
Refuses due to color	2.79 ; 3.33	1.251 ; 1.303	.286
Refuses due to texture	4.14 ; 4.00	1.027 ; 1.128	.738
Refuses due to negative experience	2.43 ; 3.17	1.222 ; 1.850	.253
Family diet has changed	2.50 ; 1.67	1.019 ; 1.371	.089
Only present accepted	2.14 ; 2.17	1.099 ; 1.467	.963
Present new items	4.14 ; 4.25	.864 ; .452	.703
Concerned about eating	3.79 ; 3.67	1.122 ; 1.557	.828
Concerned w/ nutrition	4.00 ; 3.50	1.240 ; 1.624	.383
Concerned w/ socializing	3.71 ; 2.25	1.139 ; 1.485	.009*
Concerned w/ family stress	3.07 ; 2.25	1.141 ; 1.485	.124
More concerned now	2.64 ; 2.83	1.499 ; 1.267	.732
Less concerned now	2.57 ; 2.75	1.399 ; 1.138	.727
Therapy needed soon	3.14 ; 2.75	1.292 ; 1.603	.496
Therapy not needed now	2.57 ; 2.17	1.016 ; 1.115	.343
Therapy not needed	2.36 ; 2.58	.929 ; 1.564	.666

Mean response code: 1=Strongly Disagree; 2=Disagree; 3=Undecided;
4=Agree; 5=Strongly Agree

Mean responses & Standard deviations in autism group

*The mean differences between groups are significant at the .05 level

CHAPTER V: DISCUSSION

This study was conducted to enhance the understanding of the scope and nature of feeding difficulties in young children with autism. The limited research conducted on this topic has shown consistency in the types of eating habits exhibited. Specifically, Schreck & Williams (2006) considered the types of feeding difficulties, types of foods preferred, relationship to family food preferences, and relationship to diagnostic characteristics of autism. Others have sought to define the feeding difficulties in this population by comparing their eating habits to typically developing children with no feeding problems and children with other developmental disabilities (Schreck, et al, 2004; Collins et al, 2003; Field, 2003; Ledford & Gast, 2006 Twachtman-Reilly, 2008; Williams et al., 2005). Despite the available literature, many questions remain unanswered regarding the clinical evaluation and treatment of feeding difficulties in children with autism.

Conclusions Suggested as a Result of Study

The conclusions suggested from this study are divided into the following categories: Food and Beverage Preferences and Refusals, Relationship of Cognition to Diets in Children with Autism, Sensory Differences in Children with Feeding Difficulties, Implications for Feeding Therapy, and Caregiver Concerns.

Food and Beverage: Preferences and Refusals

The fact that the snack category was the most preferred by children with autism is consistent with other studies finding preferences to carbohydrates and starches, which are high in snack foods (Schreck & Williams, 2006 & Schreck, et al., 2004). Researchers have also indicated these eating preferences in typically developing children (Schreck, et al., 2004).

When considering preference for textures, previous studies have found children with autism are more likely to only accept foods of low texture, such as pureed foods (Schreck, et al., 2004). These results are contradictory to this study which found the children with autism prefer crunchy textures and do not prefer smooth textures. Comparison between the autism and control groups found a significant difference in the texture-related preferences. On average, parents in the autism group disagreed that their child preferred smooth foods; whereas, parents of the control group indicated almost equal preferences for both textures. These results reinforce the findings that children with autism have feeding selectivities by texture and indicate they may have specific preferences for crunchy foods.

An additional difference between groups was with the number of beverages refused and accepted in the autism group. Thin liquids require versatility in the feeding process that may be difficult for children with autism. Liquids spread throughout the oral cavity in a manner unlike solid substances. This difference in oral sensation may be too overwhelming for children with autism, who have rigid preferences and routines.

In review, the previous study by Schreck & Williams (2006) explored family food preferences to the food preferences of their child with autism. They concluded family

food preferences were a higher indicator of the child's limited diets than characteristics of autism. Further investigation suggested from this study included determining if families initially modeled restricted eating patterns and influenced their child's rigid eating, or if the family's diet changed following the restricted eating habits in their child. These considerations were assessed in this study with the Eating Habits Questionnaire in which parents reported their family diet had not changed, despite the frequent refusals and selective eating in their child with autism. Parents also reported that they continue presenting new foods and beverages to their child, which indicates they are not reinforcing the child's selective eating habits. Similarly, parents in the control group reported they continue presenting new items to their child.

When considering the total number of accepted foods and beverages, results indicated the autism group accepted fewer items compared to the control group. Other studies have found children with autism accept significantly fewer items when compared to typically developing children and children with other developmental disabilities; however, previous studies have not compared the diets of children with autism to the diets of children without autism who have feeding problems. Differences of overall number of foods accepted in this study; however were not significant. Further research to explore the magnitude of restricted diets in this population is needed.

Relationship of Cognition to Diets in Children with Autism

Because of the small number of participants and inconsistency in description of cognitive functioning, no conclusion could be drawn concerning the relationship between cognition and food refusals. Further research exploring the relationship of cognition to

eating habits in children with autism would provide professionals with greater insight to treating the vast array of problems which encompass this disorder.

Sensory Differences

As expected, children with autism were reported to have more sensory differences than the children without autism across a wide range of sensory categories. Perhaps the most interesting finding regarding sensory responses between the autism and control groups was the indicated differences in Oral Sensory Processing. Based on the mean responses, parents from both groups indicated differences within this portion of the Sensory Profile. These results indicate that oral-sensory differences are a common deviant in both children with and without autism who have feeding problems.

Implications for Feeding Therapy

Although children with autism are commonly found to have feeding difficulties, limited research has focused on specific intervention approaches addressing these issues. A vast range of problems often coincide with a diagnosis of autism, making treatment for feeding a questionable priority. One aim of this study was to explore the viewpoint of parents and their willingness to seek treatment for the eating problems of their child.

The fact that parents from both groups showed ambivalence to seek feeding treatment immediately may be influenced by the type of feeding difficulties their child exhibits. Previous research has concluded children with autism and children after 2 years most often exhibit behavioral and sensory-based feeding difficulties (Rommel, et al., 2003; Schwarz, S., 2003). Unlike children with oral-motor feeding problems, children with behavioral feeding problems may be within the mean for height and weight. Adequate growth is less likely to lead doctors and nurses to recommend intervention for

feeding; therefore, families may be more inclined to manage these eating differences independently. However, growth is an insufficient metric for dismissing a feeding problem, especially when nutrition has not been considered.

Although parents seemed somewhat undecided about seeking feeding therapy immediately, their responses did indicate they consider their child's eating a problem for which they would be interested in seeking therapy in the future. It may have been expected parents in the control group would indicate more interest due to the various problems accompanying autism. However, mean responses were slightly higher in the autism group.

Caregiver Concerns

The fact that parents in both groups indicated specific concerns related to their child's eating offers important clinical implications for speech pathology. Due to the broad diversity of disorders, families may be unaware of the therapeutic supports speech-language pathologists offer for these types of feeding problems.

Professionals providing treatment to children with feeding and swallowing disorders should adhere to the following guidelines from ASHA's 2001 Scope of Practice: "Educating other professionals on the needs of individuals with swallowing and feeding disorders and the speech-language pathologists' role in the diagnosis and management of swallowing and feeding disorders; Advocating for services for individuals with swallowing and feeding disorders." Abiding by these standards is an obligation of speech pathologists to most effectively treat these populations.

Directions for Future Research

Despite the clinical implications drawn, there were limitations in this study. One limitation is that results were derived from a small number of participants (n=26). Further research with a larger number of participants is recommended to expand findings. It is also recommended that a toddler group be included to further expand knowledge of eating habits of younger children. A second limitation is the reliance on caregiver responses for interpretation of results. There is the possibility that direct oral questions and follow-ups, rather than responses to questionnaires, would further illuminate a child's eating habits and sensory abilities.

A third limitation is the reliance on descriptive information for interpretation of data, particularly with analyzing the severity of the child's cognitive deficits. Further research should consider a comprehensive tool for interpreting the child's cognition and/or adaptive functioning in comparison to feeding. As previously explained, due to the significant developmental delays in the autism group, this study could not distinguish whether differences between groups were due to autism. Deficits in cognitive functioning may have influenced the child's reported eating characteristics and sensory responses in some way.

Finally, a fourth limitation of this study is that three participants were enrolled although they had exposure to feeding therapy. It is possible the child's current eating habits were influenced by therapy.

Previous studies have compared the feeding characteristics in children with autism, to typically developing children without feeding problems and children with other developmental disabilities. This study expanded research to the area of general pediatric

feeding differences by comparing children with autism who have feeding difficulties to typically developing children with feeding difficulties. Significant differences were found, specifically with types of foods preferred and refused and indicated sensory responses.

Although researchers have considered sensory feeding differences in children with autism, studies have not included comprehensive assessment of a variety of sensory categories in comparison to typically developing children with feeding difficulties. The finding that children in both groups were indicated to have Oral Sensory Processing differences should be further investigated to determine whether pediatric feeding difficulties have a relationship to differences with oral sensory integration and processing abilities.

This study was also the first to consider the relationship of cognitive deficits to the restricted diets in children with autism. Although, descriptive information was the sole form of measurement for this research aim, professionals should consider the implications of cognition and feeding for children with autism, due to the considerable overlap in these areas.

Finally, this study considered eating habits in young children from a parent's perspective. Specifically, parents indicated whether they were concerned about their child's eating and if this concern made them inclined to seek intervention. Further research investigating how parents view their child's eating would serve to enhance treatment to a variety of pediatric feeding difficulties.

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APPENDIX A: Food Inventory Questionnaire

In each box, rate the following food items on the scale described below:

1: My child has been offered this item and willingly accepted it.

2: My child has been offered this item and refused it.

3: My child has never been offered this item.

Meats	Fruits	Veggies	Dairy	Grains	Snacks	Beverages	Misc
Ground Beef	Apples	Beans	Butter	Bagels	Pop-Tarts	Water	Pizza
Grilled Chicken	Bananas	Broccoli	Cheese	Biscuits	Candy	Milk	French Fries
Hot dogs	Grapes	Potatoes	Milk	Sliced bread	Chips	Soda	Peanut butter
Turkey	Oranges	Carrots	Eggs	Breadsticks	Cookies	Apple Juice	Cereal
Ham	Peaches	Celery	Sour cream	Buns	Crackers	Orange Juice	Oatmeal
Bologna	Pears	Corn	Cream cheese	Rolls	Popcorn	Grape Juice	Applesauce
Bacon	Pineapple	Cucumbers	Yogurt	Donuts	Pretzels	Kool-Aid	Jelly
Sausage	Strawberries	Lettuce	Ice cream	Muffins	Rice cakes	Tea	Soup
Chicken nuggets	Watermelon	Squash	Cottage cheese	Pancakes	Granola/Cereal bars		Tomato sauce
Steak	Cherries	Tomatoes	Whip cream	Rice	Brownies		Macaroni & cheese
Fish	Berries	Peas	Pudding	Pasta	Fruit snacks		Chocolate syrup

Adapted from Grocerywiz.com

Please list any other foods your child has been presented with and

REFUSED: _____

Please list any other foods your child has been presented with and

ACCEPTED: _____

APPENDIX B: My Child's Eating Habits

Please rate statements according to the following scale:

1	2	3	4	5
<i>Strongly disagree</i>	<i>Disagree</i>	<i>Undecided</i>	<i>Agree</i>	<i>Strongly Agree</i>

- 1) I consider my child's eating habits a problem.
- 2) My child has few foods they willingly accept.
- 3) My child prefers foods that are crunchy (cereal, chips, crackers)
- 4) My child prefers foods that are smooth (yogurt, applesauce, pudding)
- 5) My child prefers foods that are hot.
- 6) My child prefers foods that are cold.
- 7) My child has difficulties accepting new foods.
- 8) My child refuses particular foods and/or food groups (meats, vegetables, etc.).
- 9) My child refuses foods/drinks based on the presentation (particular bowl, utensil).
- 10) My child refuses foods/drinks based on the color.
- 11) My child refuses foods based on the texture (smooth/crunchy, soft/hard).
- 12) My child refuses foods/drinks based on a prior negative experience with that item
(choking, stomach ache, vomiting).
- 13) My family's diet has changed as a result of my child's eating habits.
- 14) I only present foods/drinks I know my child will accept.
- 15) I present new foods/drinks to my child even if they have previously refused that item.
- 16) I am concerned about my child's eating habits.
- 17) I am concerned with my child's nutrition based on their eating habits.

- 18) I am concerned with my child's ability to socialize based on their eating habits.
- 19) I am concerned with stress my child's eating habits have caused my family.
- 20) I am more concerned now with my child's eating habits than I have been in the past.
- 21) I am less concerned now with my child's eating habits as I was in the past.
- 22) I feel intervention for my child's eating habits is important and needed soon.
- 23) I feel intervention for my child's eating is important but not needed at this time.
- 24) I feel therapy intervention for my child's eating habits is not needed.

APPENDIX C: My Child's Eating Habits

Mean Responses reported for each age category:

T=Toddler, P=Preschool, E=Early Elementary, L=Late Elementary

- 1) I consider my child's eating habits a problem. **T=5; P=3.56; E=3.63; L=3.38**
- 2) My child has few foods they willingly accept. **T=5; P=3.78; E=4.0; L=3.0**
- 3) My child prefers foods that are crunchy (cereal, chips, crackers) **T=4.0; P=2.89; E=4.0; L=4.38**
- 4) My child prefers foods that are smooth (yogurt, applesauce, pudding) **T=2.0; P=3.33; E=2.5; L=2.38**
- 5) My child prefers foods that are hot. **T=2.0; P=3.44; E=3.75; L=3.0**
- 6) My child prefers foods that are cold. **T=5.0; P=2.89; E=2.13; L=3.0**
- 7) My child has difficulties accepting new foods. **T=5.0; P=4.11; E=4.0; L=4.38**
- 8) My child refuses particular foods and/or food groups (meats, vegetables, etc.). **T=5.0; P=4.44; E=4.0; L=4.13**
- 9) My child refuses foods/drinks based on the presentation. **T=5; P=3.33; E=4.0; L=3.75**
- 10) My child refuses foods/drinks based on the color. **T=5.0; P=2.56; E=3.0; L=3.38**
- 11) My child refuses foods based on the texture (smooth/crunchy). **T=3.0; P=4.33; E=4.13; L=3.88**
- 12) My child refuses foods/drinks based on a prior negative experience with that item (choking, stomach ache, vomiting). **T=1.0; P=2.67; E=2.75; L=3.13**

- 13) My family's diet has changed as a result of my child's eating habits. **T=1.0; P=2.56;**
E=1.88; L=2.0
- 14) I only present foods/drinks I know my child will accept. **T=2.0; P=2.33; E=2.0;**
L=2.13
- 15) I present new food/drink items to my child. **T=4.0; P=4.44; E=4.38; L=3.75**
- 16) I am concerned about my child's eating habits. **T=5.0; P=3.78; E=3.5; L=3.75**
- 17) I am concerned with my child's nutrition based on their eating habits. **T=5.0; P=3.67;**
E=3.38; L=4.13
- 18) I am concerned with my child's ability to socialize based on their eating habits.
T=3.0; P=3.33; E=3.00; L=2.75
- 19) I am concerned with the stress my child's eating habits have caused my family.
T=4.0; P=2.89; E=2.50; L=2.50
- 20) I am more concerned with my child's eating habits than I have been in the past.
T=3.0; P=2.44; E=2.88; L=2.88
- 21) I am less concerned now with my child's eating habits as I was in the past. **T=3.0;**
P=2.44; E=2.50; L=3.0
- 22) I feel intervention for my child's eating habits is important and needed soon. **T=4.0;**
P=3.22; E=3.13; L=2.38
- 23) I feel intervention for my child's eating is important but not needed at this time.
T=2.0; P=2.33; E=2.38; L=2.50
- 24) I feel intervention for my child's eating habits is not needed. **T=2.0; P=2.44; E=2.38;**
L=2.63

Appendix D: Additional Accepted and Refused Items

Group	Accepted Items	Refused Items
Autism	waffles, pickles, French fries, hamburgers, raisins, imitation bacon bits, chicken noodle casserole, beef stew w/veggies, popsicles, cheese puffs, Pediasure, boneless buffalo chicken strips, shrimp, fish sticks	lasagna, pizza crust, asparagus, green beans, cereal with milk, pot roast, mashed potatoes, casseroles
Control	mashed potatoes, mandarin oranges, milkshakes, baked beans, cabbage, kiwi, cake, mashed sweet potatoes, kale	Raisins, bread crust

APPENDIX E: PARTICIPANTS WITH AUTISM

ID #	Gender	Age	Diagnoses & Medical History	Description of Cognition	# Items Accepted	Oral Sensory Processing Results
1	M	EE	Autism, Sleeping difficulties	Self-contained classroom	48	Definite Difference
2	F	LE	Autism, CNS dysfunction, Mental Retardation (MR)	Severe to Profound MR	20	Definite Difference
3	M	P	Autism, CNS dysfunction, Developmental delays (DD), Behavioral management problems	Severe	42	Definite Difference
4	M	P	Autism, CNS dysfunction w/ hypotonia & motor delays, Sensory processing differences, Sleeping difficulties	Moderate	59	Typical Performance
5	F	LE	Autism, CNS dysfunction w/ hypotonia, cognitive, & motor delays, Seizures	Severe; Full time special education	26	Definite Difference
6	M	LE	Autism, CNS dysfunction w/ mild hypotonia & motor delays, Anxiety, Attention, Impulse control, & Sleeping difficulties	Mild mental disability	53	Definite Difference
7	M	LE	Autism, CNS dysfunction, MR, Anxiety, Attention, & Sleeping difficulties, Coordination & Sensory processing deficits	Severe; self-contained classroom	40	
9	M	EE	Autism, Premature, CNS dysfunction w/ hypotonia, motor, cognitive, and adaptive skills delays, Behavioral management & Sleeping difficulties	Severe; self-contained classroom	24	Definite Difference

10	M	P	Autism, MR, DD, Sleeping difficulties, Seizures	Mild MR	18	Definite Difference
11	M	P	Autism, CNS dysfunction, DD	Moderate	51	Definite Difference
12	M	EE	Autism, CNS dysfunction w/ hypotonia and motor delays, DD, Motor feeding disorder, Seizures, Sleeping disorder	FMD classroom	50	Definite Difference
13	M	LE	Autism, CNS dysfunction	ECE classroom	51	Definite Difference
14	F	P	Autism CNS dysfunction w/ mild hypotonia, gross/fine motor delays, Sleeping difficulties	Severe	35	Definite Difference
15	M	EE	PDD-NOS CNS dysfunction w/ hypotonia & adaptive skill delays Feeding disorder with history of pica PDD-NOS CNS dysf Fd disorder, Sleeping difficulties	Self-contained classroom	40	Definite Difference

Age Categories: P=Preschool (2-5 years); EE=Early Elementary (6-8 years);
LE: Late Elementary (9-11 years)

of Items Accepted are based on the total of 85 food & beverage items from the Food Inventory Questionnaire

Oral Sensory Processing results are based on parent indicated differences from the Sensory Profile

APPENDIX F: PARTICIPANTS WITHOUT AUTISM

ID #	Gender	Age	Diagnoses & Medical History	# Accepted Items	Oral Sensory Processing Results
1	M	EE	Feeding disorder, Language-based learning disorder, ADHD	40	Definite Difference
2	M	T	Feeding disorder, Developmental Delays (DD), CNS dysfunction w/ hypotonia, motor and adaptive skill delays, Childhood apraxia of speech	21	Probable Difference
3	M	P	Feeding disorder, Prematurity, Speech delays with motor speech impairment, Visual & Motor delays	24	Probable Difference
4	M	LE	Reported food refusals & difficulties accepting new foods	67	Probable Difference
5	M	LE	Reported food refusals & difficulties accepting new foods	69	Typical Performance
6	F	P	Prematurity and Sensory processing differences Reported restricted diet, food refusals & difficulties accepting new foods	24	Probable Difference
7	F	EE	Reported food refusals & difficulties accepting new foods	66	Definite Difference
8	F	LE	Reported food refusals & difficulties accepting new foods	70	Typical Performance
9	M	P	Behavioral Feeding disorder, Sensory Integration disorder	27	Definite Difference
10	M	P	Moderate-Severe Feeding disorder	43	Probable Difference
11	M	EE	Reported food refusals & difficulties accepting new foods	52	Typical Performance
12	M	EE	Reported food refusals & difficulties accepting new foods	58	Probable Difference

Age Categories: T=Toddler; P=Preschool (2-5 years); EE=Early Elementary (6-8 years);

LE: Late Elementary (9-11 years)

of Items Accepted are based on the total of 85 food & beverage items from the Food Inventory Questionnaire

Oral Sensory Processing results are based on parent indicated differences from the Sensory Profile



INSTITUTIONAL REVIEW BOARDS

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Expedited - IRB Protocol - Approval

To: Blackwell, Pat
From: The University of Louisville Institutional Review Board (IRB)
Date: Thursday, January 08, 2009
Subject: No action required

Tracking #: 08.0633
Title: Feeding Difficulties in Young Children with and without Autism
Approval Date: 1/6/2009 12:00:00 AM
Expiration Date: 1/5/2010 12:00:00 AM

The research study referenced above was reviewed by The University of Louisville Social/Behavioral/Educational Institutional Review Board for expedited review on 1/6/2009; on 1/6/2009 12:00:00 AM, Peter Quesada approved this study via expedited review procedures according to 45 CFR 46.110(b), under category 7: Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

This study was approved for children under category 1, 45 CFR 46.404: Research not involving greater than minimal risk. No greater than minimal risk to children is presented, only if the IRB finds that adequate provisions are made for soliciting the assent of the children and the permission of their parents or guardians, as set forth in Sec. 46.408. This category requires the assent of the child (if over age 7) and at least one parent's signature.

The following documents have been approved and validated for use in this study and are available in the BRAAN system:

Research Protocol, not dated
Revised Informed Consent, dated 12/30/2008
HIPAA Partial Waiver of Authorization

HIPAA Research Authorization & Revocation

This study now has final IRB approval through 1/5/2010. You should complete and return the Progress Report/Continuation Request Form EIGHT weeks prior to this date in order to ensure that no lapse in approval occurs. The committee will be advised of this action at their next full board meeting.

Site Approval

If this study will take place outside of the University of Louisville Campuses, site approval from the organization must be given before the research may begin.

The stamped approved study document(s) will follow in a general notification. If you need assistance in accessing any of the study documents, please feel free to contact our office at (502) 852—5188. You may also email our service account at hsppofc@louisville.edu for assistance. Have a wonderful day.

Best wishes for a successful study. If you have any questions please contact the HSPPO at (502) 852-5188 or hsppofc@louisville.edu.

Thank you.



Board Designee: Quesada, Peter

Letter Sent By: Perkins, Erin, 1/8/2009 8:56 AM

Once you begin your human subject research the following regulations apply:

1. Unanticipated or serious adverse events/side effects encountered in this research study must be reported to the IRB within five (5) days.
2. Any modifications to the study protocol or informed consent form must be reviewed and approved by the IRB prior to implementation.
3. You may not use a modified informed consent form until it has been approved and validated by the IRB.
4. Please note that the IRB operates in accordance with ICH guidelines and is further mandated by the Office of Human Research Protection (OHRP) and the Food and Drug Administration (FDA).
5. You should complete and SUBMIT the Continuation Request Form eight weeks prior to this date in order to ensure that no lapse in approval occurs.

Full Accreditation since June 2005 by the Association for the Accreditation of Human Research Protection Programs, Inc.





INSTITUTIONAL REVIEW BOARDS

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Expedited - Amendment - Approval

To: Blackwell, Pat
From: Human Subjects Protection Program Office
Date: Monday, February 16, 2009
Subject: No action required

Tracking #: AMEND-953 (08.0633)
Title: Feeding Difficulties in Young Children with and without Autism

The following changes to the study referenced above were reviewed and approved on 2/15/2009, using expedited review procedures in accordance with 45 CFR 46.110.

The amendment modifications include:

- Changed the subject population age from 3-11 years to 2-11 years.
- Recruiting subjects by phone and making phone calls to follow up with potential subjects.

Documents/Attachments reviewed and approved:

- AP Telephone Script

The committee will be advised of this action at their next full board meeting.

The approved and validated ICF, with the date of expedited approval is valid until the date of continuing review. The ICF is available in the BRAAN system for your use. Please do not use earlier versions.

Thank you.

Patricia K. Leitsch

Board Designee: Leitsch, Patricia

Continue following the regulations below:

1. Unanticipated or serious adverse events/side effects encountered in this research study must be reported to the IRB within five (5) days.
2. Any modifications to the study protocol or informed consent form must be reviewed and approved by the IRB prior to implementation.
3. You may not use a modified informed consent form until it has been approved and validated by the IRB.

Letter Sent By: Block, Sherry, 2/16/2009 8:23 AM

Full Accreditation since June 2005 by the Association for the Accreditation of Human Research Protection Programs, Inc.





INSTITUTIONAL REVIEW BOARDS

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Expedited - Amendment - Approval

To: Blackwell, Pat
From: Human Subjects Protection Program Office
Date: Wednesday, March 11, 2009
Subject: No action required

Tracking #: AMEND-1023 (08.0633)
Title: Feeding Difficulties in Young Children with and without Autism

The following changes to the study referenced above were reviewed and approved on 3/6/2009, using expedited review procedures in accordance with 45 CFR 46.110.

The amendment modifications include:

- The expansion of study sites in which the research study may take place. Currently the site of participation is at the Weisskopf Child Evaluation Center. In addition to this site, we are requesting subjects may also be recruited from Myers Hall Speech Language Department at the University of Louisville, or in the convenience of the participant's home.

Documents/Attachments reviewed and approved:

- Revised Informed Consent, dated 12/30/2008

The committee will be advised of this action at their next full board meeting.

The stamped approved study document(s) will follow in a general notification. Please begin using your newly approved (stamped) consent(s) at this time. The previous versions are no longer valid. If you need assistance in accessing any of the study documents, please feel free to contact our office at (502) 852—5188. You may also email our service account at hspofc@louisville.edu for assistance. Have a wonderful day.

The approved and validated ICF, with the date of expedited approval is valid until the date of continuing review. The ICF is available in the BRAAN system for your use. Please do not use earlier versions.

Thank you.

Patricia K. Leitsch

Board Designee: Leitsch, Patricia

Continue following the regulations below:

1. Unanticipated or serious adverse events/side effects encountered in this research study must be reported to the IRB within five (5) days.
2. Any modifications to the study protocol or informed consent form must be reviewed and approved by the IRB prior to implementation.
3. You may not use a modified informed consent form until it has been approved and validated by the IRB.

Letter Sent By: Perkins, Erin, 3/11/2009 11:43 AM

Full Accreditation since June 2005 by the Association for the Accreditation of Human Research Protection Programs, Inc.



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