Pediatric feeding problems related to tactile defensiveness: a case study

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PEDIATRIC FEEDING PROBLEMS RELATED TO TACTILE
DEFENSIVENESS: A CASE STUDY

By
Lauren Maguire

A Thesis

Submitted in partial fulfillment of the requirements of the
Master of Arts Degree
of
The Graduate School
at
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Approved by
MaryLouise E. Kerwin, Ph.D., BCBA-D

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The purpose of this exploratory, single-subject design study was to introduce to a child with a severe feeding disorder and tactile sensitivity different activities related to food in an attempt to increase the child’s acceptance of new foods. After a baseline assessment, the child and his parents participated in a 12-week intervention that included at least one new tactile activity and a selection of new foods the parents identified that they wanted their child to eat. In the process of conducting this study, an underlying medical problem was identified; therefore, halfway through the study, the child began to take medication to treat acid reflux. The medication seemed to help the child’s symptoms, and by the final follow-up session the child was beginning to ingest different types of foods and textures of foods.
ACKNOWLEDGMENTS

I sincerely thank the family that welcomed me into their home and graciously participated in this project. Your willingness and cooperation is very much appreciated.

I also wish to thank my friend and fellow graduate student, Karen Matsinger. Your enthusiasm for psychology and this program and your encouragement to persevere through the most challenging of times is what helped drive me to finish this project. Your friendship has been a blessing to me.
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Diet and nutrition during childhood are important for physical development and overall health throughout the lifespan. Major adulthood health conditions have been found to be strongly influenced by maladaptive and often preventable childhood feeding patterns (Stark, 1999). Some commonly known health problems related to early childhood malnourishment include osteoporosis, heart disease, diabetes, hypertension, cancer and developmental disorders (including poor growth and neurological underdevelopment) and cancer (Birch, 1990; Gisel, Haberfellner, & Schwartz, 2001). Poor nutrition can slow or complicate recovery from infections or health problems in childhood, adolescence and adulthood (Mitchell, Powers, Byars, Dickstein, & Stark, 2004) and in rare cases malnutrition and dehydration can lead to death from pneumonia (Robbins, 2006). Severe feeding problems can place a child at risk for aspiration (coughing, choking, wet or noisy breathing, or sneezing during drinking), malnutrition, failure to thrive (with the core symptom being growth failure), invasive medical procedures (i.e. tubal insertions), hospitalizations or limitation in social, emotional and educational development (Gore & Wood, 2006; Lindberg, Ostberg, Isacson, & Dannaeus, 2006; Kerwin, 1999).
Feeding difficulties are actually quite common. Between 25-45% of typically developing children and up to 80% of developmentally disabled children experience some sort of feeding problem (Davies et al., 2006) and 3%-10% of all children experience a severe feeding problem (Kerwin, 1999).

Establishing Eating Patterns

Early childhood is important in developing healthy eating and nourishment patterns to sustain health throughout the adult years (Kerwin, 1999). Between 10 and 18 years of age, a person's body weight may double (Gisel, Birnbaum, & Schwartz, 1998). When one experiences growth failure due to nutritional deficiencies, catch-up growth is particularly difficult during growth spurts because of the increased need for calories. Children with just mild feeding problems may not reach their full growth potential (Gisel et al., 1998). Children with moderate to sever feeding problems are at a much greater risk.

Oral-Motor Development

Oral-motor skills develop within a system that changes rapidly structurally and neurologically during the first three years of life (Manno, et. al., 2005). Oral-motor development involves a sequential progression of increasingly complex movement patterns within the mouth during feeding. Any disruption during the oral-motor skill and development learning process can interfere with or limit a child’s oral-motor practice and the positive feelings that should occur during feeding (Manno, Fox, Eicher, & Kerwin, 2005; Sheckman Alper & Manno, 1996).
There are four requirements that must be met to ensure successful oral-motor development. The first is stability and mobility of the ingestive system. An infant must have a stable neck and head in order for suckling to be efficient. This facilitates the mobility of the tongue and lips. Feeding is rhythmic in nature and progresses through textures. The second requirement is rhythmicity, which is the process of sequenced bursts and pauses during suckling in infants. The next requirement is food and/or liquid being sensed in the mouth. Sensory innervation in the mouth is multimodal, i.e., taste, temperature, pressure, etc. all combine to create sensory components of feeding. Finally, oral-motor efficiency and economy are requirements in feeding. A normal meal for a human (infant or adult) is 20 minutes. When oral-motor efficiency fails, feeding time dramatically increases. Humans also choose the least effortful strategy to ingest different types of food. A person must be able to ingest food efficiently in order to be economical at mealtime (Gisel, et. al., 1998).

There are several reasons for trouble in oral-motor development. There may be a delay in initiation of the swallowing reflex, which in turn causes the feeding process to be uncoordinated, which increases the risk of aspiration. Some children have a delayed cough reflex, where a cough is triggered after a bolus has passed into the airway and the child is not protected from the consequences of aspiration (Gore & Wood, 2006). Many common feeding problems are a reflection of a specific oral-motor problem, such as uncoordinated tongue movement transporting the bolus to the back of the mouth or the ability to initiate the swallowing reflex. Children engage in a variety of oral-motor experiences as they satisfy their basic needs for food and comfort and begin to explore
the world. A problem occurs when a child gets "stuck" in a feeding problem and can't progress. Because a sequential progression of increasingly complex movement patterns are required in oral-motor development, any disruption can interfere with or limit a positive oral experience, which results in loss of advancement in oral-motor skills (Manno, et. al., 2005).

**Parent-Child Relationship**

The parent-child relationship may be one of the most significant contributors to childhood feeding difficulties. Oftentimes an emotional difficulty between a caretaker and child can develop in an overcontrolling, undercontrolling, disorganized, excessively anxious, insensitive or chaotic relationship between parent and child, which can manifest into a feeding problem (Davies et al., 2006). As feeding evolves from breast milk to solid foods, it is the child's task to decide what and how much to eat. Arguments over the type and amount of food to consume should be avoided to prevent a dysfunctional parent-child feeding relationship from developing (Ernsperger & Stegen-Hanson, 2004; Gisel et al., 1998). Because parents feel responsible to make their child eat, they often resort to coercion or threats. This type of punishment may be effective for children that are not food-resistant, but for resistant eaters, this method may not be effective in increasing food intake. Resistant eaters have a "fight or flight" response, and can become distrustful and afraid of their parents and mealtime in general (Ernsperger & Stegen-Hanson, 2004). Once a child feels this way, the positive experience of the introduction of new foods is much more limited and challenging. Parents need to focus on the child and
the child’s feelings rather than the task of getting food into the child’s mouth (Ernsperger & Stegen-Hanson, 2004).

Children with physiological health disorders, physical delays, dietary restrictions, uneven temperaments or traumas may indirectly affect the caretaker and his or her relationship with the child and the child’s feeding processes (Kerwin, 1999). The feeding problem experienced by the child may indirectly influence the caregiver’s responsiveness, anxiety and ability to cope with the child at mealtime, which in turn can lead to unintended distress and malfunction of the feeding process (Davies et al., 2006; Gisel et al., 1998; Kerwin, 1999; Satter, 1995; Smith et al., 2005). As stated by Smith, et al. (2005, p.14), “Mothers of these children often feel embarrassed when their children refuse some food while dining with friends. Mothers also may feel reluctant to seek advice, because they are often blamed for their child’s eating behavior.” It is not uncommon to find mothers of children with feeding disorders not voicing concern about their children’s unusual eating patterns and preferences because they do not want to be judged or criticized. In addition to attention given to the child with a feeding problem, treatment often must involve caregiver education and support (Smith et al., 2005).

_Treatment of Feeding Problems_

Behavioral and cognitive-behavioral interventions, individual psychotherapy, hypnosis, and family-oriented interventions have all been used in isolation or combined as treatments for severe feeding problems (Kerwin, 1999). Since severe childhood feeding problems are often due to multiple biopsychosocial etiologies, finding effective treatments is a problem. Inconsistent definitions of the feeding problems, inferior
experimental designs, small sample sizes and inadequate control groups/conditions further complicate the process of developing effective treatments for most individuals (Kerwin, 1999).

Assessment

After a feeding disorder has been determined to be a crucial problem for the child, a feeding team should decide which method of treatment would be most successful for that child (Gisel et al., 1998; Kerwin, 1999; Sheckman-Alper & Manno, 1996). Just as the sensory integration approach has been applied to those with tactile deficiencies, interventions for feeding disorders have been combined into treatment packages that can include behavioral techniques, psychosocial or interactional techniques that address physiology, parent-child interactions, oral-motor functioning, and family functioning (Sheckman-Alper & Manno, 1996; Kerwin, 1999).

An informal feeding assessment should begin with the child and his or her caretakers meeting with a speech and language therapist (SLT) to establish the child’s ability to swallow safely (Gore & Wood, 2006). The child must be alert and responsive and demonstrate “reasonable” control of his or her oral secretions and cough reflex. The child’s posture during feeding should be overseen by both an occupational therapist and a physical therapist, especially if the assessment is conducted in the early stages of the child’s rehabilitation program (Gore & Wood, 2006).

In theory, a common misconception is that thin fluids are the safest substance to begin to introduce to a child during a feeding trial. In fact, it has been found that thin fluids are most likely to be aspirated (Morgan, Ward, Murdoch, & Bilbie, 2002). Thicker
fluids move at a slower rate and enable the bolus to maintain cohesion and provide sensory feedback, which allows the child to have a greater sense of control over the oral phase of swallowing (Scheckman-Alper & Manno, 1996; Gore & Wood, 2006). Therefore, it is best to begin a feeding trial with thickened or semi-solid fluids. The outcome of this will determine if it is actually safe to progress to more thickened foods (Gore & Wood, 2006).

_Treatment of Oral-Motor Difficulties_

Clinicians need to be certain that a child is able to safely handle the food items introduced to them when addressing chewing skills because of the child’s increased risk for choking due to oral-motor deficiencies (Scheckman-Alper & Manno, 1996); therefore, depending on the child’s oral-motor skills, a selected range of appropriate foods are made available to the child at the food-introduction stage. Foods that tend to break apart without chewing are ideal (i.e. cheese curls or small pieces of graham cracker) (Scheckman-Alper & Manno, 1996). Initially, lateralization and “munching” skills are practiced via putting a food substance in a child’s mouth and rather than having them swallow, ask the child to try to maneuver the food item around in the mouth, side to side and stabilizing the tongue between movements. When the child has become proficient with tongue munching and lateralization, harder foods that require greater chewing effort can be introduced (Scheckman-Alper & Manno, 1996). Mixed consistency food (e.g., spaghetti with sauce and/or dry flaky foods that do not form a cohesive bolus) are usually avoided for children with oral-motor problems (Gore & Wood, 2006).
Individualized cases of oral-motor dysfunction require an individualized program to introduce foods with increasingly difficult textures. The individualized nature of the situation makes it difficult to find enough participants to conduct a group study to develop an effective, valid and reliable intervention that can be applied to any child experiencing a solely oromotor dysfunction with no other known developmental disabilities. Unfortunately most single-subject or small-n studies fail to meet the requirements necessary to become judged efficacious or probably efficacious. As a result, clinicians are forced to use or adapt to feeding techniques that may have been found to be effective for children with unrelated feeding difficulties thereby potentially compromising the effectiveness of the intervention for the child whom they are treating (Sheckman-Alper & Manno, 1996).

*Treatment of Tactile Defensiveness: Sensory Integration*

Occupational therapists believe that children with inflexible, predictable and repetitive ways of interacting with their environments may be experiencing a sensory integration disorder (Brasic-Royeen, 1986; Baranek, et al., 1996). “The sensory integration theory is based on principles in neuroscience, developmental psychology, occupational therapy and education (Schaaf & Miller, 2005, p.143):

1) sensorimotor development is an important substrate for learning
2) the interaction of the individual with the environment shapes brain development
3) the nervous system is capable of change (plasticity)
4) meaningful sensory-motor activity is a powerful mediator of plasticity
In 1972, Ayres reported that occupational therapy using sensory integration approaches coupled with special education was a promising method to improve academic scores of children with learning disabilities (Cohn, 2000; Schaaf & Miller, 2005). There are four key principles of the sensory integrative approach as depicted in Table 1 (Schaaf & Miller, 2005, p. 144):
Table 1

*Four Principles of Sensory Integration Therapy*

<table>
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<th>Principle</th>
<th>Description</th>
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<td>Just Right Challenge</td>
<td>The therapist creates playful activities with achievable challenges; the activities incorporate a challenge but the child is always successful</td>
</tr>
<tr>
<td>The Adaptive Response</td>
<td>In response to the Just Right Challenge, the child adapts their behavior with new and useful strategies, thus furthering development</td>
</tr>
<tr>
<td>Active Engagement</td>
<td>The therapist’s artful creation of challenging, yet playful, sensory-rich environments entice the child to participate actively in play; the methods of play incorporate new and advanced abilities that increase the child’s repertoire of skills and processing</td>
</tr>
<tr>
<td>Child Directed</td>
<td>The therapist constantly observes the child’s behavior and reads their behavioral cues, thus following the child’s lead or suggestions. The therapist uses the child’s cues to create enticing, sensory-rich activities</td>
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Sensory integration therapy is considered a supplement to enhance the brain’s capacity to perceive, remember, and motor plan as a basis for learning, and provides motor activities rich in tactile stimulation. Ayres (1964) used an occupational frame of providing intervention. The goals of therapy were to include occupational functions of early childhood, including playing, eating and interacting with others embodied the key concept of active participation and challenge (Schaaf & Miller, 2005).

Occupational therapy focuses on multiple domains of child functioning: abilities, activities, and sense of self-worth. It is believed that changes in one domain can affect the other two areas of functioning (Cohn, 2000). Using this theory, a child’s maladaptive functioning in one area would lead to deficits in other areas, and conversely, an improvement in one area could lead to improvement in the others (Cohn, 2000). The aim of occupational therapy in sensory integration treatment is not to try to “fix” a person, rather, to focus on the broad context in which children live and to design an intervention that involves both the parents and the child and the way they live, work and play in the social world (Cohn, 2000). Expectations of treatment, particularly those of the parents, are discussed, and acceptance, accommodation and advocacy of the child are strongly encouraged (Cohn, 2000).

A sensory integration approach focusing primarily on severe childhood feeding disorders and tactile/oral defensiveness is a well known issue in occupational and sensory integration therapy, yet little research has been performed in the field (Smith, et al., 2005). This study will use a single-subject design to evaluate a feeding intervention for a child with severe feeding problems that is suspected to be due to oral defensiveness and
for whom the child has a history of behavior indicating tactile defensiveness. The intervention is based on sensory integration therapy and has structured activities designed to encourage the child to handle edible and non-edible items and textures both during and not during meals. The hypothesis is that the child will become more comfortable and will eventually eat new foods previously rejected by that child.
CHAPTER II

METHOD

Participants

Inclusion criteria for this study were children between the ages of 3 and 12 years of age who exhibited a resistant eating pattern of ingesting less than ten types of food for at least one-year prior to the assessment; the language capacity of a three-year-old; and no known physical disabilities. Children who already had received an intervention from a dietician or occupational/speech therapist were excluded from this study. Children previously determined to be diagnosed with autism, Down’s syndrome, cerebral palsy, cystic fibrosis or some other type of developmental disability that may have an impact on feeding ability other than a speech impediment were also excluded from the study. Children receiving nasogastric feeding or tubal feeding for nutrition were also excluded from the study.

Participants were sought using a recruitment flyer placed in the lobby of three different pediatrician’s offices and two day care facilities. The pediatricians and the day care operators were informed of the study and were encouraged to refer any children they believed could benefit from the intervention. The child chosen for the study (DM) ended up being recruited upon the referral of a child psychologist at Rowan University. The psychologist was called in to work with DM because of his eating aversions and uncooperative mealtime behavior. DM seemed to have some speech difficulties and
began to attend speech therapy sessions during the intervention. DM also seemed to have more of an aversion to sweet and/or unusual smells than uncomfortable or unusual textures. DM’s age was also slightly younger than ideal, however there were few responses to the recruitment flyer and of the children interviewed, DM was the most similar to a participant that could benefit from intervention.

Instruments

Behavioral Pediatrics Feeding Assessment Scale (BPFAS)

BPFAS assesses rate and frequency of mealtime behaviors via caregiver self-report (Mitchell et al., 2004). It contains 35 items that assess problematic parent and child mealtime behavior. The first 25 items assess child mealtime behavior and the last 10 items are specific to parents’ feelings or strategies to manage their child’s mealtime behavior. The instrument uses a 5-point Likert scale (1 [never] to 5 [always]) to assess the frequency of behavior. Parents are also asked to answer “yes” or “no” regarding whether the behavior is a problem for the whole family.

The BPFAS yields four scores: child-behavior frequency (i.e. sum of 5-point Likert scores on each item: range 25-125), child-behavior problems (i.e., total number of items rated yes; range 0-25), parents’ feelings/strategies-frequency (i.e., sum of 5-point Likert scores on each item; range 10-50), parents’ feelings/strategies-problems (i.e., total number of items rated yes; range 0-10). Frequency scores reflect how often the child and parent behaviors occur. Problem scores reflect the number of behaviors the parents consider to be problematic. The higher the score, the more maladaptive the feeding/eating behaviors are considered to be. The BPFAS has been validated in children...
from 7 months to 7 years of age and has been used in numerous studies with children 5 years of age and younger (Mitchell et al., 2004).

*Touch Inventory for Elementary School Aged Children (TIE)*

The TIE is a screening tool designed to examine behavioral responses related to a single sensory system. The rationale for the TIE is based on Ayres’ research regarding sensory integrative dysfunction theory (Royeen & Mu, 2003). It is a 26-question screening tool designed for children of elementary school age (6-12 years old) to screen for tactile defensiveness. The TIE is designed to be administered by a wide range of professionals and requires minimal training to use. The TIE takes ten minutes to administer as an individual self-report, and provides insight to the child’s perceptions of tactile stimuli. Adaptations of caregiver input can also supplement the information given by the child. The calculation of the test scores is relatively simple (Royeen & Mu, 2003). The internal consistency of the TIE has been found to be acceptable, alpha= 0.74 (Royeen, 1986). It has an 85% correct classification rate, and has established construct reliability (Royeen & Mu, 2003). Test-retest reliability was first established over a two week period and resulted in \( r = 0.5883, p = 0.0001 \) (Royeen, 1987) and a repeated analysis of test-retest reliability of a one-week span resulted in an improved \( r \) value of 0.91, \( p < 0.001 \) (Bennett & Peterson, 1995).

*Food and Activity Log*

After the assessment and interview, the mother of the participant was asked to keep a record of DM’s eating patterns by way of a food log, and a record of the activities she would attempt with DM by way of an activity log. The food log was a chart where
she was able to write what exactly DM ate and drank during the meals and approximately how much of each item he ingested. The mother was also encouraged to document any unusual eating patterns or foods consumed. The food log was helpful in not only keeping track of DM’s mealtime foods and behaviors for the researcher, but also helped the mother become more aware of DM’s feeding rituals as well. The activity log was simply a sheet of paper where the mother could describe which activity she would try during each week of the study and DM’s reaction and willingness to participate in each intervention activity.

*Experimental Design*

A single-subject design was used to conduct this study with a baseline phase lasting 1 week and intervention lasting 12 weeks.

*Intervention*

A 12-week treatment manual was developed using the concepts, skills and games provided in the treatment plan (beginning on page 105) of *Just Take a Bit: Easy, Effective Answers to Food Aversions and Eating Challenges* (Ernesperger & Stegen-Hansen, 2004). The treatment manual was designed to concentrate on two steps of intervention. The first segment was based on *Environmental Controls*, which focused on providing the family with a consistent eating schedule and aimed to increase an appropriate setting and reduce chaos at mealtime. The second segment was based on *Stages of Sensory Development for Eating*, which introduced play activities and a food-rich environment to broaden the child’s tactile relationship with foods and other previously uncomfortable
tactile objects, which aimed to increase the child’s acceptance of new foods and touching situations.

The guidelines of the manual and the goals of the intervention were discussed by the researcher and the family, and a mutually agreeable schedule was collaborated. The family and researcher decided to meet once per week (schedules permitting). At each meeting they discussed any noticeable signs of change in the child’s behavior or attitudes over the course of the preceding week (if any), the positive and negative feelings of the entire family towards the changes and an activity for DM to try during the week. If adjustments needed to be made they were done so in a collaborative and compromising manner. The family was given the researcher’s contact information in case issues or questions they were not sure how to address arose during the week.

The mealtime strategies in the manual were flexible, and if necessary allowed the family to come up with their own unique ideas similar to the suggestions of the manual to elicit change in the mealtime environment at home. The open communication between the family and researcher during the experiment helped maintain research integrity because everyone was given an opportunity to contribute to the collective goal of increasing the child’s comfort in handling foods and participating in (and hopefully beginning to enjoy) family meals. If any member of the family became uncomfortable with any part of the intervention strategies, they were strongly encouraged to raise their concerns so a new method could be implemented.

Sessions were held once per week at 5:00 pm, which was DM’s usual dinnertime. If DM and his mom were not available for dinner, a lunch meeting was arranged. DM’s
father was usually at work for the sessions, but if he happened to be available and attend the meal his presence was noted and documented. The beginnings of the sessions were usually used to finish preparing DM’s meal and to review the activities and new feeding/mealtime/behavioral developments and improvements (if any) DM made over the week. Once the meal was ready, DM was seated at the table. The researcher would observe and document the types of food and beverages presented, the number of touches, tastes and actual bites DM would take with the food/drink, and any behavior traits he exhibited during the mealtime session. If DM was disruptive, refused to eat or performed any unusual behavior, it was documented. If DM tasted any new foods it was also documented.

Procedure

A child and his family were contacted by the researcher and an initial meeting was set up in the family’s home. When the family and the child agreed to participate in the study, the participant’s mother provided informed consent, and the child provided assent according to the procedures approved by the Rowan University Institutional Review Board. Prior to providing informed consent, the researcher formally introduced herself to the family and explained what would be expected of everyone throughout treatment. After signing the informed consent form, the participant’s mother was then asked to complete the BPFAS and the TIE pertaining to her son’s feeding and tactile behaviors, and the child participant was formally chosen to participate based on his severely limited diet indicated by his unusually high score on the BPFAS, and his tactile defensiveness, indicated by his elevated score on the TIE.
The child and his caregiver(s) were asked to begin to keep a log explaining the family’s normal mealtime environment. Some points of particular interest included biological details of the family, parent/guardian and familial eating habits/rituals, the typical mealtime setting (time of meals, place of meals, etc.), feeding habits of the child, smell and temperature of food and texture of food previously and currently ingested by the child, detail of the child’s likes and dislikes of food, the (known) allergies of the child and the child’s medical history. A food diary of all foods and liquids ingested by the child was also required throughout the course of the study.
CHAPTER III

RESULTS

Medical, Feeding and Developmental History

DM was 2 years, 10 months old at the time of the baseline assessment. DM was an only child and lived with his mother and father. Meals were always offered in the dining room and mostly involved the mother, who was home to feed DM for the majority of the meals while the father worked. The major concerns DM’s mother had about DM’s feeding were that he had a very limited variety of types of food that he would ingest, and if he was presented with a disliked food he would have a very strong reaction to it, including gagging and crying. Meals were frequently prolonged due to DM trying to get up (prevented by a booster seat with a strap at times), throwing food and/or utensils, and a refusal to eat.

DM had been displaying an aversion to eating since he was one year old, right around the time he made the transition from formula to solid foods. DM had always seemed more interested in drinking than eating, however when he liked the food he would eat well. DM’s strongest negative reactions to food were usually when the food had a strong smell. Any type of food with a sweet odor or taste was particularly repulsive to DM. DM was very suspicious of foods and if a new food was presented would usually touch and smell it prior to any attempts to taste the new food. DM was at a very low weight for his age. At one point he was in the 3% range for his age, however at the time
of the assessment his mother reported he was up to the 40% range. DM’s weight at the
time of the baseline assessment was 32 pounds, and his height was 36”.

**Baseline Assessment Results**

DM’s total frequency score on the BPFAS was 80. A score of 84 or higher would reflect that the subject displayed a significantly higher frequency of maladaptive feeding behaviors than the norm. The score of 80 was still very high, and demonstrated the subject exhibited a high frequency of problematic behaviors at mealtime. The total problem score for the BPFAS was 13. A problem score greater than 9 suggests that the maladaptive feeding/eating behaviors at mealtime are significantly greater than the mean. DM’s problem score demonstrated that at the baseline assessment he had a significant problem with mealtime feeding/eating behavior.

DM’s score on the Touch Inventory for Elementary-School-Aged Children was 34. The mean of the test is 41, with a standard deviation of 7.8. DM’s score was below the mean, indicating a modest resistance to certain tactile stimuli, however his score did not fall within a range to categorize him as having significant touch issues.

**Maternal Report of Progress**

In a discussion with DM’s mother during the 6-month follow-up assessment, she said that DM developed a taste for fruit, particularly bananas. At baseline, DM did not like to touch or taste fruit, let alone ingest it. At the 6-month follow-up, DM’s mom said he liked bananas so much she was packing one a day for him in his school lunch. DM still did not eat vegetables, which was bothersome to her, however because of the addition of fruit to his diet she was not nearly as concerned about
his dietary nutrition intake as she was at the beginning of the study. She seemed happy with his progress and optimistic he would continue to show improvements in his acceptance of new foods and eventually be open to eating vegetables.

DM’s mother also noted that DM had begun to drink beverages through a straw. During the treatment phase DM was offered drinks accompanied by a straw, however he was perplexed by the straw and did not seem to understand what it was or how to use it so he was given a sippy cup as an alternative. At the 6-month assessment he was able to drink from both soft drink straws with fairly large openings and from juice box straws with small openings, indicating an improvement in his oral coordination on multiple levels. She said his chewing patterns remained fairly the same (from what she could gather from observation) and he still preferred softer foods and avoided meats. She said his lack of eating meats was still a concern for her, but his improvement with the other aspects of his eating made her optimistic he would learn to advance his chewing in time.

Activity Log

During the study, DM’s parents were asked to complete a log of all activities completed. Table 2 summarizes the activities DM and his family participated in throughout the intervention.
Summary of Activities Completed by Participant During Intervention (5/17/08 - 8/4/08)

Activity 1: Painting With Food
5/17/08; 11:00 am; Length of activity: approx 10 minutes

Materials: Broccoli spears (new food), carrot sticks (disliked food), ranch dressing (new food) & ketchup (liked food), construction paper

Food ingested: Lick of ketchup

Summary of activity:
DM was interrupted from outside play to come do the activity and wasn’t happy. Both researcher & mom demonstrated dipping broccoli and carrots in both condiments and painting on the paper in front of him. DM refused to touch the broccoli or the carrots but did touch the condiments on the paper and swirled them around with his hands. He touched the ketchup and licked his finger once. He did not try to eat the ranch dressing. He started to become agitated with the activity quickly so we stopped. Mom says anytime he tries something new he is slow to warm up. She’ll try again with new “paintbrushes” and new condiments. I also asked her to try sitting next to him and drawing a picture (like a smiley face) while he watched before giving him the food so he can better understand what we’d like him to do.

Activity 2: Mom and subject only: Painting with food
5/20/08 (Tuesday)
Time: 10:10-10:12 am
Details: Tried painting with broccoli and ranch dressing again. Mom softened the broccoli and made the pieces thinner to be easier to grasp. DM would not touch anything this time, not even the paper. Much more resistant this time than initial trial.

Activity 3: Mom and subject only: Baking cookies & whipped cream
5/20/08 (Tuesday)
Time: 2:30-3:00 pm
Details: DM loved playing with the flour- he was covered from head to toe. They used rolling pin from his play doh set so he thought it was play doh. He squeezed the dough, flattened the dough and rolled it out. He used small cookie cutters and with hand-over-hand assistance he used sprinkles to decorate the cookies. DM watched mom put the cookies in the oven but when they came out he would not even look at them. Time: 3:00-3:15- DM finger painted with whipped cream and started to put some on the cookie. He touched the cookie to get the whipped cream off but would not put the cookie to his mouth. He tolerated the whipped cream being put on his face around his mouth and used his tongue to get it off. At one point he did try and spit it out. Seemed to
tolerate the whipped cream on his hands but didn’t seem to enjoy it.

<table>
<thead>
<tr>
<th>Activity 4: Mom &amp; subject only: Cream Cheese Play Doh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date: 6/3/08</td>
</tr>
<tr>
<td>Time: 2:00-2:30 pm</td>
</tr>
<tr>
<td>Details: DM had a lot of fun with the play doh. He loved squeezing it. He made shapes with cookie cutters. He smelled it a little bit before he ate some. After they were done playing, mom put some on a cracker but DM wouldn’t eat it. Mom put some cream cheese on bread and he took a few bites. He liked playing with it more than eating it.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity 5: (Mom and subject only): Peeling an Orange</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date: 6/6/08</td>
</tr>
<tr>
<td>Time: 1:30-1:33 pm</td>
</tr>
<tr>
<td>Details: DM did not want to touch the orange at first. Then he touched the peel with one finger and the orange with one finger, smelled it, then pushed it away. Mom showed him how to eat it &amp; offered him a piece again, but he pushed it away making a face.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity 6: (Mom and subject only): Cream cheese play doh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date: 6/9/08</td>
</tr>
<tr>
<td>Time: 1:50-1:52 pm</td>
</tr>
<tr>
<td>Details: DM and mom tried the play doh again but this time he was more resistant and he wanted nothing to do with it. The play doh was stickier than last time and the texture seemed to bother him. He didn’t want to touch the play doh- he just wanted to get down from the table. The play doh was left over from the last time, which seemed to change the consistency.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity 7: Grow a garden (Mom, Nanna, Pop Pop, &amp; subject)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date: 6/14/08</td>
</tr>
<tr>
<td>Time: 1:00-1:30</td>
</tr>
<tr>
<td>Details: David’s Nanna &amp; Pop Pop have a garden, so mom and DM went there to plant basil. David loved digging the hole. He helped mom with the seeds. He enjoyed filling in the hole. Then DM used his small squirt bottle to water everything in the garden. It was a lot of fun for everyone. They will be checking on it and watering it every couple of days. DM loved digging in the dirt, but does not like the feeling of the grass on his hands.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity 8: Selecting a recipe from cookbook (Mom &amp; Subject only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date: 6/23/08</td>
</tr>
<tr>
<td>Time Begin: 11:00 am</td>
</tr>
<tr>
<td>Time end: 12:15 pm</td>
</tr>
<tr>
<td>Details: Mom &amp; DM selected peanut butter bites from the “Everything Kids Cookbook.” DM floated back &amp; forth from the kitchen to the family room. He helped mom add the</td>
</tr>
</tbody>
</table>
dry ingredients and then became more interested in how the mixer worked. Mom tried to get DM to roll the dough but he wouldn’t touch it. He watched mom put the cookies in the oven and take them out. Mom offered him a piece but he wouldn’t touch it—just pushed he hand away. She will try to keep offering the cookies to him until they are gone.

Activity 9: Cheerios on a String (mom and subject, 3 days in a row)

Date: 6/30/08
Details: Since it was the first time trying the activity, DM wasn’t sure what to do. He only touched the Cheerios with his hands and moved them back and forth on the string that way.

Date: 7/1/08
Details: On the 2nd day, DM allowed his mom to put the Cheerios to his mouth but did not lick them.

Date: 7/2/08
Details: On the 3rd day DM played with the Cheerios on the string and put them to his mouth but again would not lick them. Mom made them into a necklace and put it on him but he immediately took it off and gave it back to her.

Activity 10: Lollipop (With mom and new speech therapist)

Date: 7/3/08
Time: 3:15-3:25
Details: DM was offered a lollipop and he took it. At first he smelled it and then touched it. Mom showed him how to lick it and told him how good it was. He continued to hold it and smell it. Mom smelled it and told him it smelled good. DM never licked it but he did put it to his lips a few times. He didn’t get upset with it (he usually hates sweets). It seemed like he enjoyed holding it. They will keep trying.

Activity 11: Picking grapes from vine (with mom)

Date: 7/8/08
Time: 1:30-1:33
Details: DM first tried to get away from mom with grapes but she quickly showed him what to do and asked him to pull. He willingly pulled the grape from the vine and smelled it. He then rolled the grape across the floor and ran away. Mom tried to get him to do it again but he wasn’t interested. Mom showed him how to lick it and take a bite but he wasn’t interested.

Activity 12: White cheddar cheese puffs (with mom)

Date: 7/11/08
Time: 2:00-2:05 pm
Details: Mom offered DM a cheese puff (white in color) and he pushed her hand away. Mom broke a piece off of one and DM touched it, but then again pushed mom’s hand away. Mom modeled eating and licked the puff but DM again did not want to try it. Mom told DM how good the puff was and that it was cheese (liked food) but he got upset with her. Mom will continue to try to offer them to DM but she thinks he has a hard time getting past the texture.

Activity 13: Lollipop (with mom at a party)
Date: 7/20/08
Details: Today was DM’s birthday party. DM watched other kids eating their lollipops so mom gave DM one. He at first just held it, then he put it to his mouth. Mom witnessed DM looking at the other kids and then he licked it once and then gave it back to mom. Mom praised DM for trying it.

Activity 14: Cutting, touching and tasting watermelon (with mom)
Date: 7/27/08
Time: 1:00-1:05 pm
Details: Mom and DM cut up a watermelon with cookie cutters. DM had no problem with the cookie cutters but did not like the feel of the watermelon. He did a few shapes and then touched the watermelon with one finger and licked his finger. After the taste, he wanted nothing else to do with it and ran away. Mom tried to show DM how to eat the watermelon but DM got upset with her. Mom also offered DM cantaloupe but he ran away again.

Activity 15: Take a bite (with mom)
Date: 8/4/08
Time: 2:00-2:20
Details: Mom presented DM with (liked) foods she normally used to cut up, but now left whole to see if he would take a bite. First she presented a bagel. He took one bite, but then wanted her to cut it up. Mom then presented DM with a hamburger bun, which he did take several bites of without needing it to be cut up. Finally mom presented DM with a soft pretzel. DM would not take a bite off as a whole, but if she broke off large pieces he then took a bite. Mom also observed that DM seemed to move his tongue around more while eating.

The information and data contained in Table 2 reveals that DM did not touch most objects that had a taste and/or smell. When it came to playing with cookie dough, cream cheese, play doh, and watermelon for example, he was open to touching the objects until he realized they had a sweet taste, which was and has been unpleasant to him. When the
activity was attempted for a second time, he remembered the unpleasantness and rejected
the activity altogether. Interestingly enough, DM liked digging in the dirt to plant basil.
The unusual texture did not seem to be as much of a deterrent as the taste/smell of what
he was touching. DM did not like the sweet taste of the lollipop, however when exposed
to peers eating lollipops at a birthday party he seemed more willing to give the lollipop a
second taste. Social relations with peers could be a promising step for DM’s acceptance
of new foods as he enters school and becomes influenced by others his age.

*Weekly Meals Observed by Researcher in Home*

Table 3 contains the researcher’s notes recorded during the observation of each
weekly meal in the home during the 12-session treatment.

*Table 3*

*Researcher Notes During Weekly Home Visits for 12-Week Intervention*

5/14/08
The first thing DM did was put his hand in the applesauce. He then became disgusted &
needed his hand washed immediately. He then went to the carrot sticks and threw them
across the room. Mom moved applesauce completely away from the table. He went to
the macaroni & cheese bowl and began playing with the food. He put a handful of food
on the table at a time and would occasionally put a noodle in his mouth and eat it. In
between bites he would swirl the food all over the table (mom said she allows this b/c it’s
the only way he’ll eat). He finally dumped the entire bowl on the table, swirled the food
around and ate it one bite at a time, with about a minute between bites. DM was very
slow and showed very little interest in food, only eating one noodle at a time. Mom tried
to re-present applesauce and DM gagged. Applesauce was taken away.

Side notes: Mom told me she once mixed baby food squash in the macaroni & cheese.
She couldn’t taste a difference, but DM did, and he gagged. He’s still slow to eat
macaroni & cheese in case she does it again. DM will ONLY eat spiral macaroni &
cheese noodles. They can’t go out to dinner & order b/c he won’t eat elbow macaroni.
DM only drinks out of sippy cups and cannot suck out of straws. His sense of smell is so
sensitive he once gagged going into a fudge shop without even seeing the food and threw up one time at someone’s house that just had mulch put down.

5/21/08
Mom had food prepared when I arrived. DM does not know how to eat whole slice of pizza, so she cuts it up for him. She put cooked peas in a side dish attached to the pizza plate. DM always thrusts his hands into food before eating, and that’s how he touched the peas twice before commencing meal. He eats slow and doesn’t show much interest for food, although pizza is a preferred food. He played with some of the pieces before eating, but didn’t put all of the food on the table like last time. Mom presented 4 peas for him to pick up from her hand. He picked them all up, threw 2 and left the other three in her hand.

I asked mom if she models eating non-preferred food to him and she said she does all the time. She said in keeping the food log she realized he drinks a LOT of fluid throughout the day: around 48 oz or more: 4 oz juice mixed w/ 4 oz water, flavored water & milk are the only liquids he’ll drink, only from a large sippy cup. He likes to keep the sippy cup with him all the time, even if it’s empty. She wonders if the fluids may fill him up, causing him to not be very hungry for meals?

Activities mom tried with DM this week:
Painting with food: 3 times
Baking cookies: 1 time (She said DM did well with preparing the cookies- he touched the dough with no problems. Once it started baking and the smell filled the kitchen, he wouldn’t go near the cookies when they were done).

6/4/08
DM totally rejected the hot dog, so he was a bit resistant to the ziti when it was presented right afterward. Mom got him a sippy cup of milk, and he kept the sippy cup in his mouth between bites. Halfway through meal DM picked up a fork and chewed on it for a bit before throwing it across the room and resuming eating. Total meal time= 23 minutes.

6/11/08
He was resistant to sitting down to meal. He settled down after mom gave him a drink (carrot juice). He tasted syrup after 1 bite of French toast. He seemed okay at first, then disgusted. After one more bite of French toast he pushed the plate away and refused meal. Mom put the french toast on a new plate with no syrup but he already associated the French toast with it. Even after his hands were washed and entire area was cleared of syrup he pushed the plate away.

Mom has pictures of his “liked” foods. She tried to get him to pick a picture of something he would like to eat but he wouldn’t choose. She made a backup meal.
DM was tired throughout both meals. Mom said he was out all day. He just wasn’t interested in food.

6/18/08
DM was resistant during most of meal. He tried the A-1 first, which may have set him off to eating. Mom said he had a haircut earlier, which he usually is extremely resistant to. Usually he screams and squirms, but today he got right up in the chair and let them cut his hair with no problems. Mom rewarded his good behavior w/ chips, which may have led to his lack of appetite. At the end of the observed meal, dad tried to play with DM w/ hands and leftover food. Dad made a “face” with the veggies, which agitated DM so much he screamed and flicked all the food away from him.

New food this week: DM tried a scrambled egg w/ cheese out at breakfast on Sunday. Although eggs used to be a liked food, he hasn’t touched them in months. He ate a whole egg.

6/27/08
(Dr. Kerwin present for this meal); DM uses a suck pattern to eat, and is able to do so w/ pizza. Chewing meat requires lateral tongue movement, which causes food to get lost track in mouth and can cause a gag. Sometimes acid reflux is a precursor to this. DM had and still has acid reflux. 1st step= control the acid reflux. Then, work on getting tongue moving. More tongue movement= better speech. Less acid reflux + more tongue movement= more acceptance and less fear of chewing and trying new foods! Good foods to start with= Cheese curls or Lorna Doone cookies (start with a crunch and melt in mouth: integrates crunch with puree and integrates tongue movement). Activity for next week: Cheerio on string in front of mirror. Have DM watch himself move cheerio from one side to the other with tongue only.

7/2/08
DM ate a mini bagel at the store during food shopping that day which may have affected his hunger. DM doesn’t normally eat bagels.

* DM usually makes noises while he eats. To date, he hasn’t been able to make one understandable phrase. His noises don’t involve complex mouth movement, mostly just a moaning/humming while chewing and in-between bites. Tonight I noticed the noises are becoming more complex and he is moving his tongue more and pulling his cheeks in.

7/9/08
DM took some double and triple-ziti bites during this meal. He seemed really hungry and ate very well. This was his first whole week on the drug Axid, used for acid-reflux. His mom said he tried a new food this week: hash brown w/ onion, which he liked. Also, put a lollipop to his lips. DM started school this week. His speech is definitely starting to get
clearer...he even said “buh buh” for bubbles, which his grandfather blew for him during the day and mom blew during the meal to entertain him to keep him eating.

7/26/08
Many developmental milestones were met this past week. DM is in the process of getting potty-trained (not successful so far). Mom also stopped strapping him into the booster seat at the table. DM now has a choice to sit on a regular chair at the main dining table, or he can go to a small table in the corner with table & chair his size. Mom has been giving DM non-cut foods in the past week or so, and DM seems to be adjusting well. Instead of cutting the pizza into bite-size pieces, she cut the pizza in half. This time of eating requires DM to take a real bite and use his front teeth to tear the food. At times, DM scraped the cheese off and ate it with his fingers. Sometimes he picked the whole piece up and bit a piece off. I noticed he is not making as much noise while eating (humming, babbling). DM seems more focused on food while chewing. He only hummed lightly a few times. He did get up from the table a few times b/c he wasn’t strapped in, but came back to finish the meal.

8/2/08
DM ate a late breakfast (pancakes) so he wasn’t super hungry. Mom said he also drank a lot that morning. He also is no longer strapped in so he was free to get up and wander, which broke his concentration from eating. He was totally not interested in his food. Mom told me DM has started to eat off of her plate, which never used to happen.

8/6/08
Mom worked a lot this week w/ DM taking bites off large food items instead of cutting up the food first, and for the most part DM has been receptive to it. Foods included bagels & soft pretzels. Unfortunately no new foods, but his chewing patterns (biting food, tongue movement to manipulate food, and his concentration on food) have seemed to improve since the beginning of study. DM is still and will continue to take antacid medication from his pediatrician.

Special note: Note that since the beginning of study, DM has worked with a speech therapist, a pediatrician (who prescribed antacids), and began school, where he has not only worked with new special needs teachers, but has been exposed to peers, which may have an impact on his eating habits.

9/24/08 Follow-up Assessment
DM is back in the booster seat, however he isn’t strapped in. Mom was having trouble keeping him seated & meals were taking too long. DM used a fork for some bites. This is the first I’ve seen of this. Mostly he still picked up food with hands. DM hardly made any noise (humming), except for when he drank with meal. He took a few bites of garlic bread from mom’s plate. He had 2 slices of American cheese before dinner, which may have curbed his appetite. While eating the garlic bread, I noticed DM “cheeks” his food
and chews from the outer side of his teeth, indicating he still had limited tongue coordination to chew. Dad confirmed this is a normal chewing method for DM, especially with crunchy food (like the crispy garlic bread). DM also seemed agitated to be clothed during this meal. He kept tugging and stretching his onesie top. Mom and dad said he's been taking his clothes off and running around nude quite often, a new trait for him.

Changes since last meeting:

David has tried the following foods (* means disliked food previously):

- * Peanut butter & grape jelly (jelly is sweet and previously disliked). DM took 2 bites
- * bite of a carrot. DM spit out, but did take a bite.
- Baked ziti (he liked to pick & pull the cheese)
- Home fries
- * Apples (shared with mom. She took a bite and gave him a piece). Fruite is sweet and previously disliked.
- Long spaghetti noodles
- Saltines
- Garlic bread
- * turkey lunch meat (took 2 slices from dad)
- * cream cheese on bagel (used to be very disliked, now he can't get enough)

Mom also added that DM is increasingly more interested in what is on her plate and taking things from her plate to try. Seems DM is slowly overcoming his fear of sweet/sticky foods and unknown foods and is becoming more willing to try them. Peer influence from school may have something to do with this.

In summary, the researcher's notes during the weekly meals indicate that although there is still room for improvement in DM's feeding behaviors, the new foods introduced and consumed by DM toward the end of the study were rapidly increasing. DM still seemed uninterested in sitting down and eating, however his tolerance was better than it was in the beginning of the study. In the middle of the study Dr. Kerwin, a psychologist from Rowan University specializing in childhood feeding disorders, came to a session to observe one of DM's meals. She noted his lack of interest in bitter foods and suggested
that DM’s mother talk to DM’s pediatrician about putting him on an acid-reflux medication. DM’s mother was cooperative and had him on medication by the next week. It seemed that after the introduction of the medication DM started to become less resistant to new foods and was slowly becoming more receptive to testing new things. This strongly supports the theory that DM’s resistance to sweeter foods was more due to an acid-reflux issue than a sensory disorder.

The ratio of how much DM drank during a meal to what he ate started to skew as the study progressed, and he was becoming more interested in filling himself with food than with liquid. Another promising observation is that DM’s eating patterns matured from the beginning of the study through the end. He was able to bite off chunks of food to chew rather than have mom cut it up for him (hamburger buns and pizza for example). Although impossible to accurately read, DM’s mouth seemed to move differently while chewing, as though he was learning to use his tongue and manipulate food a bit better. DM’s speech was becoming a bit clearer and less mumbled as well. DM’s mother seemed happy with his progress and confident that he would continue to improve with age and school attendance and speech therapy.

Quantitative Data During Weekly Feeding Sessions

Figure 1 depicts the number of times DM touched foods that he liked versus foods that he did not like during each weekly feeding observation. Up until session 6 (6/27/08), the average number of times DM touched foods that he liked was 22.5 times compared to an average of 2.8 times for a food that he disliked. It should be noted that the majority of these “touches” of a disliked food were to throw it off the table.
Figure 1

Frequency of Touches

Date


Foods that were Liked
Foods that were Disliked
Over the course of 12 sessions, DM only tasted a disliked food during a structured mealtime observation 2 times and each time that he tasted the food, he swallowed it. Specific details of the number of touches and tastes are contained in Table 4.

Table 4

Details about Touches, Tastes, and Swallowing of Liked and Disliked Foods During Weekly Mealtime Observation Sessions

<table>
<thead>
<tr>
<th>Date/Session</th>
<th>Food Presented</th>
<th># of touches of food</th>
<th># of tastes of food</th>
<th># of bites swallowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5/14/08</td>
<td>1 bowl macaroni &amp; cheese</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(spiral noodles)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>liked food</td>
<td>approx 30+</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>2 small carrots</td>
<td>1 (threw across table)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unsweetened applesauce</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>disliked food</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Session 2:</td>
<td>pizza (cut in pieces)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5/21/08</td>
<td>liked food</td>
<td>28</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Peas</td>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

34
<table>
<thead>
<tr>
<th>Session</th>
<th>Date</th>
<th>Meal Description</th>
<th>Liked</th>
<th>Touches of</th>
<th>Ketchup</th>
<th>Both</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>6/4/08</td>
<td>hot dog (sliced lengthwise like french fries) served w/ ketchup</td>
<td></td>
<td>dog=1</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>previously liked, but now disliked food</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(backup meal)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ziti w/ spaghetti sauce</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>liked food</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>6/11/08</td>
<td>french toast sticks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>liked food</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>syrup on side</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>disliked</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(backup meal)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>bagel w/ butter cut</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>into</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>bite-size pieces</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>liked food</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>french fries (w/)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>liked food</td>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

35
6/18/08 seasoning
liked food
A-1 dipping sauce
new food 1 1 1 (disgusted)
0 (after A-1 experience
Ketchup
liked food 0 0 skeptical)
mixed steamed 3 (threw back like veggies a ball
disliked food or toy) 0 0
grilled chicken
disliked food 0 0 0

Session 6: 22 (fastest
6/27/08 meal eaten)
pizza (cut in pieces) I observed
liked food 22 22 yet)
chicken (cut in pieces, 0 (threw entire
presented w/ ketchup) 0 0 plate on floor)
<table>
<thead>
<tr>
<th>Session</th>
<th>Meal Description</th>
<th>Liked Food</th>
<th>Disliked Food</th>
<th>Licks</th>
<th>Licks</th>
<th>Licks</th>
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</thead>
<tbody>
<tr>
<td>Session 7</td>
<td>mozzarella sticks</td>
<td>31</td>
<td>Oatmeal</td>
<td>24</td>
<td>24</td>
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<td>7/2/08</td>
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<tr>
<td>Session 8</td>
<td>ziti w/ sauce</td>
<td>32</td>
<td>Oatmeal</td>
<td>32</td>
<td>32</td>
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<tr>
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<td>Ellio's pizza</td>
<td>27</td>
<td>Oatmeal</td>
<td>24</td>
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<td>Session 10</td>
<td>slice of pizza</td>
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<tr>
<td></td>
<td>Bowtie noodles &amp; butter</td>
<td>35</td>
<td>Oatmeal</td>
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<tr>
<td>Session 12</td>
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<td>29</td>
<td>Oatmeal</td>
<td>30</td>
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<td>him</td>
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<td>9/24/08</td>
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<td>Follow-up</td>
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</table>

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Scores on Standardized Instruments

DM’s baseline frequency score on the Behavioral Pediatric Feeding Assessment Scale was an 80, which put him very close to being significantly higher than the normative mean (84). His 6-month post-treatment frequency score was a 65, a 15-point drop (see Figure 2). DM’s total problem score on the BPFAS initially was a 13, which was significantly higher than the normative mean. At the 6-month post-treatment assessment, the score dropped to a 7, taking him below a score of 9, indicating his parents were not having significant problems in their eating/feeding experiences with DM at that time.
DM’s score on the Touch Inventory for Elementary School-Aged Children was a 34 at the baseline assessment. At the 6-month assessment it dropped to a 32. Neither score categorized DM as having significant touch issues. The items that changed seemed somewhat subjective. DM’s score on having his hair combed dropped from “a little” to “not at all,” and having his nails cut increased from “a little” to “a lot.” DM’s score on both “going barefoot in the sand or in the grass” and “getting his face touched” dropped from “a little” to “not at all.” DM’s scores on the questions dealing with his attention remained the same: “does it bother you to stand in line” had a response of “a lot” and “do you find it hard to pay attention” remained at “a little.”
CHAPTER IV
DISCUSSION

DM showed several major observable changes in his eating habits from the time the study began until its completion. One improvement was that he was able to bite pieces off of the food presented to him rather than have mom cut the food into pieces for him prior to eating. This behavior suggested an improvement in DM’s ability to manipulate the food in his mouth during feeding. During the study it was discovered that DM had trouble laterally moving his tongue in the feeding process, and primarily used a “sucking” pattern to chew food (which is why pre-cut pieces were easiest for him to ingest). His progress with speech therapy most likely helped him to learn to begin to laterally use his tongue to manipulate and chew food, which seemed to help him become more receptive to trying new foods. At the 6-month follow-up DM’s mother reported his new ability to drink liquids through a straw. Both of these improvements could have been the result of his improved speech (he was seeing a speech therapist throughout the study). Since speech requires skills in mouth and tongue coordination, the new skills may have led DM to improved eating and drinking patterns as well.

DM had acid reflux as an infant, and it was found during the course of this study that DM may still be suffering from it. DM was prescribed antacids which immediately seemed to help his appetite and gradually lower his resistance to new foods. His mother noted that his face didn’t seem to “pucker” as much after taking bites of somewhat acidic
food and that he seemed to be enjoying meals. He seemed to concentrate on eating more and tried to get up from his seat less and made less “gurgling,” humming and other distractive noises during meals.

The major confounding variables in this study were that DM’s condition was mostly due to an adversity to sweet smells and sweet or sour tasting foods rather than touch, as originally planned for, and he was a bit young to adequately qualify to be a candidate for the TIE. Despite that, DM was still a good candidate for an intervention because the treatment manual was very flexible and easily altered to better accommodate his condition. Touch and smell are both sensory processes and in that regard they are related to one another. DM’s mother and the researcher chose touch activities that would also introduce DM to a variety of new foods. Some foods had strong smells while others had no smell at all. DM disliked or had no interest in most of the activities his mother attempted with him, however there were some activities he did not seem to mind and even liked.

DM’s least favorite activities were those that involved him touching foods with odor or a strong and unfamiliar taste (i.e. he liked ketchup (familiar) but did not like ranch dressing, A-1 sauce, or oranges, to name a few). One of the most interesting activities was when he made sugar cookies with his mom. DM loved playing with the flour, flattening the dough, rolling it out and cutting it with cookie cutters, but once the cookies went into the oven and put off a sweet odor, he didn’t want anything else to do with them. The fact that he liked touching the cookies had little impact on his distaste for
their smell. In this case, touching the food made little impact on the outcome. If DM had more issues with touch rather than smell, this activity may have been more beneficial.

Some of the activities DM participated in with his mother demonstrated that DM did have a few issues with textures and touch and not just smell. DM liked playing in the dirt during the "Grow a garden" activity, but did not like the feeling of the grass on his hands. He also liked playing with cookie cutters during the watermelon activity, but did not like the feel of the watermelon, and totally rejected it after he tasted the sweetness of the fruit on his fingers. There is no doubt that DM's eating issues had a lot to do with a high sensitivity to sweet tastes. Even when DM made an attempt to lick or taste sweet foods (such as the lollipop), his distaste for the sweetness always disgusted him. This issue seems to be more the result of acid reflux than an issue with tactile sensitivity.

From the time the study commenced, DM worked with a speech therapist, a pediatrician (who prescribed antacids), and began school, where he not only worked with new special needs teachers, but was exposed to a new environment and interacted with peers, which may have had an impact on his eating habits. DM's speech seemed to improve after he started to attend school, and his verbal cues to either ask for or reject food were much clearer to understand. DM was also at a pivotal time of development. His gradual acceptance of new foods could have been the natural result of aging. The most feasible explanation for DM's growing interest in food was probably a combination of the multiple avenues of therapy and attention to his feeding problems. It is impossible to decipher whether any of the touch activities made any improvement on DM's eating patterns, however the activity log did provide his family an opportunity to be mindful of
things they could do to be creative in combining food and fun and continue to help DM find eating to be more enjoyable.
REFERENCES


