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Effectiveness of Bite Charts in Behavioral Feeding Intervention

Natalie Gray
Eastern Illinois University

Melissa Council
Eastern Illinois University

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The study "Effectiveness of Bite Charts in Behavioral Feeding Intervention" was completed to fulfill a requirement for CDS 5001, Research Experience in Communication Disorders and Sciences (CDS). A partner was required for this research project, since neither of us chose to write a thesis. We both carried equal weight throughout the semester long project. Natalie Gray helped locate participants from an outside clinic and Melissa Council attended therapy sessions with both participants. We equally divided up the research and written portion.

This study pertains to CDS because feeding is part of the scope of practice for a speech-language pathologist (SLP). There are numerous areas and placements for SLPs, so we chose an area that we are less familiar. We have had a few lectures in feeding and more are expected; however, we were curious and wanted to research the topic. A behavioral feeding disorder is when children do not want to eat the food. There is no sensory aversion or medical condition which keeps these children from eating. Also, negative behaviors are often demonstrated at meal times.

A bite chart is a method of positive reinforcement that is used by SLPs and families however, limited research is available. There is no published definition for a bite chart; therefore, for the purpose of this study a bite chart is a manila folder divided into four quadrants with a piece of Velcro in each quadrant. There is a motivating sticker that corresponds with each quadrant. On the lower right quadrant, there also is a piece of Velcro and a picture of a preferred activity that the child chose. The bite chart begins with no pictures or all the pictures on it. When the child takes a bite, s/he removes or adds a sticker. When four bites are taken and the bite chart is empty or full, the child gets to do the preferred activity.

In our study, the participants began with the bite chart and each had consistent bite acceptance at 100%. When the bite chart was withdrawn, both participants' bite acceptance decreased and negative behaviors were exhibited. When the bite chart was reinstated, both participants bite acceptance was consistent and increased to 100%.

Eastern Illinois University's Booth Library was the foundation of our research paper. We both spent hours at Booth Library's Reference computers and on their online catalog. The reference librarians were very helpful. We had a one-on-one meeting with Pam Ortega, who sat down with us for at least thirty minutes helping us search journal articles, ordering books from the Interlibrary Loan, and locating books from Booth Library. She continued throughout the evening to check on us to make sure we were doing well. Other reference librarians who helped us search were also very willing and eager to help. They intently listened to our study and tried multiple ways to help us find journal articles for our paper. The librarians responsible for Interlibrary Loan were helpful when we needed to renew the books we borrowed. Other librarians from Booth Library were helpful in assisting us in locating books within the library. Without the assistance given from the staff of Booth Library, our research would not have been as thorough and complete as it was. The staff helped us locate the most recent and applicable articles to our study.

References

Ahearn, W.H. (2002). Effect of two methods of introducing foods during feeding treatment on acceptance of previously rejected items. *Behavioral Interventions*, 17, 111-127. doi: 10.1002/bin.112

This article found that positive reinforcement alone is not effective to treat behavioral feeding disorders. This applies to our study because the bite chart was used as a method of positive reinforcement and was found effective.

American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision*. Washington, DC: American Psychiatric Association.

This manual cited the diagnostic criteria for feeding disorders which was used in our study to aide with subject selection criteria.

Casey, S.D., Cooper-Brown, L.J., Wacker, D.P., & Rankin, B.E. (2006). The use of descriptive analysis to identify and manipulate schedules of reinforcement in the treatment of food refusal. *Journal of Behavioral Education*, 15 (1), 41-52. doi: 10.1007/s10864-005-9001-7

This study compared positive reinforcement and escape extinction as methods of treating food refusals. They found that positive reinforcement is more effective than escape extinction. In our study, positive reinforcement was the only method used and therefore this article supported our research study. This article also provided the definition of a bite acceptance and refusal used in this study.

Casey, S.D., Perrin, C.J., Lesser, A.D., Perrin, S.H., Casey, C.L., & Reed, G.K. (2009). Using descriptive assessment in the treatment of bite acceptance and food refusal. *Behavior Modification*, 33, 538-558. doi: 10.1177/0145445509341457

This study looked at the effectiveness of using both escape extinction and positive reinforcement to treat behavioral feeding disorders. This helped support the use of the bite chart to hold the subjects accountable to complete each trial.

Fishbein, M., Cox, S., Swenny, C., Mogren, C., Walbert, L., & Fraker, C. (2006). Food chaining: A systematic approach for the treatment of children with feeding aversion. *Nutrition in Clinical Practice*, 21, 182-184. doi: 0884-5336/2102-0182\$03.00/0

This article found that behavioral modification techniques are essential to treat behavioral feeding disorders. This supported our use of the bite chart as a method of positive reinforcement because reinforcement is a component of the behavioral theory.

Fraker, C., Fishbein, M., Cox, S., & Walbert, L. (2007). *Food chaining*. New York: Marlowe Company.

This book addressed the medical feeding disorders and the professionals who treat them. This was used in our study as a way to differentiate the different types of feeding disorders. This book provided extensive information regarding food chaining to determine the foods used in this study.

Fraker, C., & Walbert L. (2003). Evaluation and treatment of pediatric feeding disorders: From NICU to childhood. Temecula, California: Speech Dynamics Inc.

This book discussed the continuum of feeding disorders from mild to severe to aide us in our subject selection criteria. This book also addressed using reinforcers and motivators when positive behaviors occur. This was used in our study because the bite chart was a type of positive reinforcement.

Gentry, J.A., & Luiselli, J.K. (2007). Treating a child's selective eating through parent implemented feeding intervention in the home setting. *Journal of Developmental Physical Disabilities*, 20, 63-70. doi: 10.1007/s10882-007-9080-6

This article discussed food selectivity and the involved criteria as well as they used a chart to make the subjects aware of how many bites s/he was responsible to take. This idea of using a visual chart to make subjects aware is similar to the concept of using a bite chart.

Hillman, H.L. (2006). Functional analysis and food refusal: A brief review. *The Behavior Analyst Today*, 7 (1), 48-55.

This article found that differential reinforcement increased the number of bites in non-preferred foods. They provided social praise and preferred foods when bites of non-preferred foods were swallowed. This supports the idea of allowing the child to participate in a preferred activity after the four bites on the bite chart have been accepted.

Hoch, T.A., Babbitt, R.L, Farrar-Schneider, D., Berkowitz, M.J., Owens, J. C., Knight, T.L., Snyder, A.M., Rizol, L.M., & Wise, D.T. (2001). Empirical examination of a multicomponent treatment for pediatric food refusal. *Education & Treatment of Children*, 24 (2), 176-198. ISSN: 0748-8491

This article found that combining positive reinforcement and continual “contingency contraction” effective. Food and drink was provided continuously until the subject accepted the bite or drink. Upon acceptance, positive reinforcement was given. The bite chart is similar, once bites have been accepted; positive reinforcement is given in the form of a preferred activity.

Kedesdy, J., & Budd, K. (1998). *Childhood feeding disorders*. Baltimore, MD: Brookes.

This article provided a classification system for feeding disorders and a definition for a feeding disorder that was addressed in the study. Based on these definitions, the subject selection criteria was reduced to only children who do not eat enough.

Kerwin, M.E. (2003). Pediatric feeding problems: A behavior analytic approach to assessment and treatment. *The Behavior Analyst Today*, 4 (2), 162-176.

This article addressed the importance of treating feeding disorders before they progress into more severe aversions. This supports the idea that successful methods for behavioral feeding are needed.

Kerwin, M.E., & Eicher, P.S. (2004). Behavioral intervention and prevention of feeding difficulties in infants and toddlers. *Journal of Early and Intensive Behavior Intervention*, 1 (2), 129-140.

This article discussed the importance of modeling since young children have a tendency to imitate. In this study, the speech-language pathologist often modeled what the subject was going to do prior to them completing the task.

Linscheid, T.R. (2006). Behavioral treatments for pediatric feeding disorders. *Behavior Modification*, 30 (1), 6-23. doi: 10.1177/0145445505282165

This article found that behavioral feeding disorders are on the rise, indicating the need for behavioral feeding intervention. That supports the basis of our study in researching the effectiveness of bite charts in behavioral feeding intervention.

Luiselli, J.K. (2000). Cueing, demand fading, and positive reinforcement to establish self-feeding and oral consumption in a child with chronic food refusal. *Behavior Modification*, 24 (3), 348-358. doi: 10.1177/0145445500243003

This study used a participant who was given a chart as a way to make him/her aware of the number of bites expected. This study also gave preferred activities when the number

of expected bites was taken. This is similar to the concept of the bite chart in that it involves positive reinforcement and an expected number of bites.

Ma, H.H. (2009). Comparisons of the relative effectiveness of different kinds of reinforcers: A PEM approach. *The Behavior Analyst Today*, 10 (3&4), 398-427.

This article stated the importance of using preferred reinforcers over non-preferred reinforcers. Also, letting the subject to make some choices allows them to feel more in control of the situation. This was important in our study because preferred reinforcers were given and the subject was allowed to make choices regarding the order of the food presentation.

Nexttext. (2001). Introduction to Psychology. Illinois: McDougal Littell. P. 102-103.

This book provided the definitions for the terms: *reinforcement, positive reinforcement, two types of punishment, and negative reinforcement*. These were definitions used in the study to ensure the correct type of reinforcement was being used.

Ramsay, M. (1988). Food refusal in failure-to-thrive infants: Nasogastric feeding combined with interactive-behavioral treatment. *Journal of Pediatric Psychology*, 13 (3), 329-347. doi: 0146-8693/88/0900-0329\$06.00/0

This article addressed the concept of desensitization with regards to feeding. This concept was not directly addressed but rather one subject was working on increasing mixed textures into their diet. This was completed gradually as recommended from this article.

Tewes, L. (2007). Early intervention for children with autism: Methodologies critique. *Developmental Disabilities Bulletin*, 35 (1&2), 148-168.

This article addressed ABA and the LOVAAS therapy as behavioral interventions to increase a desired behavior. This was not directly utilized in this study but the concept of stimulus, response, reinforcement was. The subject was given a bite of food (stimulus), then had to swallow it (response) and was then given verbal praise or a preferred activity (reinforcement).

Thompson, S.D., Bruns, D.A., & Rains, K.W. (2010). Picky eating habits or sensory processing issues? Exploring feeding difficulties in infants and toddlers. *Young Exceptional Children*, 13 (2), 71-85. doi: 10.1177/1096250609351805

This article defined a sensory processing problem which aided with subject selection criteria in the study. In this study, minimal sensory aversions were only accepted, and this definition provided guidance as to who to include and exclude.

EFFECTIVENESS OF BITE CHARTS

Effectiveness of Bite Charts in Behavioral Feeding Intervention

Natalie Gray, BS, Eastern Illinois University

Melissa Council, BS, Eastern Illinois University

Project Completed in Fulfillment of CDS 5001 Requirement

Dr. Tina K. Veale, PhD, CCC-SLP

Beth Bergstrom, MS-CCC-SLP

Abstract

This study evaluated the effectiveness of a bite chart as a method of positive reinforcement in behavioral feeding intervention. The bite chart was used to increase bite acceptance. Using a BAB research design, the researchers found the bite chart effective for two subjects with differing diagnoses, ages, environments, and therapists.

Chapter I

Introduction and Review of Literature

A feeding disorder is an inconsistency in ingestive behaviors causing a significant discrepancy from the norm. Many parents use feeding milestones (eating independently, drinking out of a cup, using utensils, table manners, etc.) as a comparison measurement to mark their child's progress through development. These milestones also provide a sense of pride and accomplishment for the parents (Kedesdy and Budd, 1998 p.1). When feeding is a problem, parents may not know where to go or who to ask for help. Feeding disorders are on the rise and can occur in both typically developing children and children with disabilities.

Hoch (2001) stated, "At some point 25% of infants and children and 33% of persons with developmental disabilities exhibit feeding problems attributable to inadequate motivation or skill deficits." Hoch (2001) continued by providing examples of behavioral feeding problems which include "food refusal, food selectivity by type or texture, and mealtime tantrums." According to Hillman (2006), feeding behaviors occur in many healthy children but are more frequent in children with disabilities. More often when children have a feeding disorder associated with a disability, the feeding disorder is due to a medical condition (cleft palate) or sensory aversion (autism). Kerwin (2003) found that 3-10% of children endure severe and persistent feeding problems, which progressively worsen. Therefore, intervention is necessary to ensure the feeding disorder does not progress.

Linscheid (2006) reported that 45% of children who are typically developing experience feeding problems. They occur at higher rates for children with mental retardation and other developmental disabilities. In the past ten years, hospitals have treated approximately 40-60

feeding cases per year, or approximately 10% of the total inpatient case load. Behavioral treatment programs for feeding disorders are on the rise, indicating a need for current research on effective treatments in behavioral feeding. Many children experience some form of a feeding disorder (sensory, behavioral, or medical) and require treatment to maintain adequate nutrition for growth.

Behavioral Interventions

Numerous behavioral interventions have been adapted for behavioral feeding problems. Choice-making is the key to success, as well as, using preferred reinforcers over non-preferred reinforcers (Ma, 2009). Letting children make decisions allows them to feel more in control of their situations, and encourages them to cooperate. Children are egocentric and complete tasks that benefit them. They may be more likely to accept a target food, if they are allowed to choose a preferred activity.

Functional analysis is a behavioral intervention that examines the antecedent behavior, the behavior itself, and then the consequence of the behavior. This analysis is used to determine the function of the behavior and what triggered it (Hillman, 2006). If the reason is known, the environment can be manipulated to reduce the re-occurrence of the behavior. If the antecedent (what happened prior to the behavior) has to occur, then subjects can be prepared and learn more appropriate ways to respond. Functional analyses break down behaviors, so they can be understood in order to minimize inappropriate behaviors.

Applied Behavioral Analysis (ABA) therapy is a behavioral intervention for individuals with autism or related disorders. A series of trials are used to teach and manipulate desired behaviors and responses with the use of positive reinforcement after each trial. A trial consists of

a stimulus (what is presented to the individual), a response (what the individual says or does), and positive reinforcement (verbal or tangible reinforcement). The skills are broken down into the simplest components to allow for comprehension and generalization of the skills (Tewes, 2007). Another type of behavioral intervention for individuals with autism or related disorders is the Lovaas therapy. The goals of Lovaas therapy include increasing the development of language, social behaviors, cooperative play, and appropriate toy play. Lovaas therapy is similar to ABA in that it breaks down the skills into the simplest form and teaches those skills using positive reinforcement after each trial (Tewes, 2007).

Types of Reinforcement

According to Nexttext (2001), reinforcement is defined as “any event that encourages or discourages repetition of a behavior” (p.102). In this study, four types of reinforcement will be addressed. They are positive reinforcement, negative reinforcement, and two types of punishment. Positive reinforcement encourages a behavior by providing something enjoyable after a behavior is completed. One example of positive reinforcement is giving a child a piece of candy after s/he completes a chore. Punishment is providing negative consequences after an undesirable behavior occurs. Spanking a child when they disobey their parents is one example. Another form of punishment is not allowing a child access to a desired activity/object. An example of punishment is not allowing a child to watch television, because they did not finish their chores. Negative reinforcement is not a form of punishment; rather it is withdrawing a non-preferred stimulus. An example of negative reinforcement is driving in rush hour traffic. After leaving the office late one night, one realizes that s/he was able to avoid rush hour traffic. Therefore, the individual is reinforced for leaving the office later than usual. These types of reinforcement can be combined with other behavioral treatments or can stand alone.

Casey, Cooper-Brown, Wacker, and Rankin (2006) found that positive reinforcement alone is effective in treating food refusal. In their study, positive reinforcement was given after each bite. The number of bites the child accepted increased, and the refusals decreased. This study also addressed escape extinction in which the child is responsible to take the bite or drink no matter the length of time. Negative behaviors from the client increased due to the impact of the escape extinction techniques. Many studies have found that positive reinforcement alone is not an effective way to manage behavioral feeding; however, Casey et al. (2006) were able to show that positive reinforcement was a more successful method compared to escape extinction.

Differential reinforcement. Differential reinforcement is a form of treatment used in behavioral feeding intervention. This method supports food consumption by providing the child access to a preferred food and social praise based on the acceptance of swallowing bites of non-preferred foods (Hillman, 2006). Casey et al. (2006) defined a bite as a “receipt of food into the client’s mouth independently or when fed by an adult.” A refusal was defined as a “client turning her head away from a bite offered within 1 inch of her mouth, pushing away the bite/spoon, or expelling from her mouth any food or drink following an acceptance” (Casey et al., 2006, p. 43-44). Using these definitions of a bite and a refusal made data collection more accurate. The acceptance of a bite can be controversial if a clear definition is not provided. Using these definitions eliminates this confusion (Casey et al., 2006). Many of the studies reviewed used this definition or a similar one.

Types of Feeding

Sensory feeding. Thompson, Bruns, and Rains (2009) defined a sensory processing problem as “an individual’s inability to process incoming stimuli from his or her environment in

a productive way” (p.72). This definition can be applied to sensory feeding aversions. An example of sensory aversion is avoiding a certain type of food because of its texture. Four sensory processing patterns identified by Thompson et al. (2009) were poor registration, sensitivity to stimuli, sensory seeking, and sensory avoiding. “A threshold is a modulation of information by creating a continuous interchange among habituation and sensitization” (Dunn, 1997).

An individual who has a high threshold (too much habituation) has poor registration and appears uninterested in the environment. A strategy for working with an individual with poor registration is using a direct (structured) approach and making food more visually stimulating. An example is creating a face on a pancake rather than serving it plain. Sensitivity to stimuli occurs when an individual has too much sensitization and tends to be distracted. Treatment options include systematically and consistently establishing new textures based on the individual’s sensitivity needs. For example, slowly combining real bananas with stage 2 baby food bananas would be a way to increase a client’s acceptance of more textured food (Fraker, 2003). Sensory seeking is when an individual looks for sensory stimulation. Due to a decrease in sensory stimulation, behaviors may occur when an individual has too much habituation and tends to be involved in behaviors which increase their sensory experiences. Thompson et al. suggested offering finger foods, which provides the client tactile stimulation. Sensory avoiding is the last sensory processing problem. This happens when the individual attempts to get out of meals, because there is too much stimulation. This individual has a low neurological threshold (too much sensitization) causing the child to become overwhelmed. Sensory feeding involves understanding the client’s sensory needs and using that in order to create a nutritional plan for the client.

Behavioral feeding. Behavioral responses are the “manner in which the young child responds in relation to the thresholds” (Thompson et al., 2009, p. 72-73). Individuals have unique responses to the environment and sensory modulation, which contribute to their difficulty in feeding. Feeding problems include food refusal, food selectivity by type or texture, and behavioral problems (e.g. tantrum, crying, yelling, etc). A child may choose food based on the food’s taste, texture, temperature, and appearance which may lead to poor nourishment or behaviors at mealtime (Gentry & Luiselli, 2007). For example, children may accept applesauce because of the smooth texture, but refuse to eat an apple due to the solid texture. Parents may not recognize feeding problems as behavioral. While dealing with behavioral issues is not easy, children need to have adequate nutrition to grow and stay healthy.

According to the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text revision [DSM-IV-TR]), a child is considered to have a feeding disorder if they meet the following four criteria. The first criterion is “the client must persistently fail to eat adequately.” Secondly, the client must not “have any medical condition severe enough to cause a feeding problem.” Thirdly, the feeding problem is not better accounted for by a “mental disorder or lack of available food.” Lastly, the client must “present with these symptoms before they are six years old” (American Psychiatric Association, 2000).

A study conducted by Casey et al. (2006) found that children are often diagnosed with behavioral feeding disorders after medical factors have been ruled out. This article also stated that negative reinforcement encourages children to continue displaying inappropriate behaviors. During observations of parents whose children display inappropriate mealtime behaviors, the researchers noted that the parents use a variety of consequences when behaviors occur. The use of consequences reinforces the child’s inappropriate behaviors, because attention is drawn to

them. If the child does not have to eat due to behaviors, the child will quickly learn that those behaviors allow them to do what s/he want (Casey et al., 2006). Behavioral feeding disorders are associated with food refusal. Researchers in this field recently found differences in the effect of positive reinforcement in increasing the child's acceptance of food (Ahearn, 2002, Casey et al., 2006). Ahearn (2002) found that positive reinforcement alone is not effective, but when paired with a more invasive (escape extinction) method, the positive reinforcement decreases the negative impact of the more invasive method. Casey et al. (2006) found that positive reinforcement alone is enough to increase bite acceptance.

Medical Feeding. Medical feeding problems occur when a child has a medical condition that causes eating to be painful or unpleasant. Many symptoms such as vomiting, choking, coughing, heartburn, constipation, or rash may indicate a medical feeding problem. Children may reject food for multiple reasons; however, the most common medical conditions related to food rejection are allergies, breathing difficulties, and gastrointestinal issues. Breathing difficulties may cause children to reject food due to difficulty breathing while eating or painful swallowing. An otolaryngologist (ENT) may be an important member of the feeding team for children with breathing difficulties. Gastrointestinal issues also make eating unpleasant. If a child experiences gastrointestinal issues, a gastroenterologist is a key member on the feeding team. Medical feeding disorders are treated differently than sensory or behavioral feeding disorders, because specialized doctors need to prescribe medication, perform surgery, or modify the child's diet in order to minimize the symptoms (Fraker, 2007).

Kedesdy and Budd (1998) defined a feeding disorder as "a deviation of ingestive behavior with significant clinical consequences" (p. 14). They created a multidimensional classification system for all areas of ingestive behaviors. Categories in this system include

“children who eat too little,” “children who eat too much,” and “children who eat the wrong things” (p. 14). The category for “eating too little” includes severe selectivity and failure to thrive (FTT) associated with under eating. The category for “eating too much” include obesity and hyperphagia (increased appetite for food consumption; often associated with a lesion to the hypothalamus). Pica (eating non-food items) and rumination (regurgitation of previously swallowed food to be eaten again) are examples of children who “eat the wrong things.”

Kedesdy and Budd (1998) continued with etiologies associated with eating disorders and placed them into categories including: physical competence (dysphagia), chronic illness (cystic fibrosis), interaction (distracting or unsupportive feeding environment), diet (developmentally inappropriate diet), appetite (supplemental feeding), child construction (difficult temperament) and caregiver competence (maladaptive nutrition beliefs). This classification system makes classifying individuals with feeding disorders more exact and clear cut.

According to Fraker and Walbert (2003), children diagnosed with mild feeding aversions are considered “picky eaters.” The child’s growth and development are not affected by mild food aversions. On the other hand, severe feeding aversions are an extreme self-restriction of food intake causing major developmental, social, and health problems (Fraker & Walbert, 2003). Due to the impact of food aversion, proper diagnosis and care are important for the development and health of the child.

Behavioral Feeding Interventions

There are numerous treatments for behavioral feeding disorders. When the feeding disorder is behavioral (not sensory or medical) in nature, behavioral interventions are used to

increase the number of bites accepted. Fishbein et al. (2006) stated that “behavior modification techniques are integral to the treatment of feeding disorders in children” (p. 183).

Escape extinction. Escape extinction, is a behavioral principle that requires the individual to take a bite or drink independent of time constraint. One type of escape extinction involves nonremoval of the spoon (NRS). In this technique, the utensil is loaded with food and placed at the child’s lower lip until a bite is taken. Physical guidance is another form of escape extinction. This requires the clinician to physically open the child’s mouth and place food in the mouth. Escape extinction has some limitations, which include possible injury, pain, or resistance to the task. Initially this technique may result in an increase in frequency and intensity of problem behaviors (Gentry & Luiselli, 2007).

Researchers found using a combination of behavioral interventions to be effective. Using a combination of escape extinction and positive reinforcement decreased potential negative side effects by providing positive reinforcement after bites (Gentry & Luiselli, 2007). Casey et al. (2009) provided three reasons why escape extinction should be paired with positive reinforcement. The first reason is intervention success may be increased due to the positive reinforcement. Secondly, adding positive reinforcement can alleviate the negative side effects of escape extinction. Lastly, Casey et al. found that adding positive reinforcement makes escape extinction more socially acceptable and care providers may be willing to implement these procedures (Casey et al., 2009).

Another combination includes combining positive reinforcement and continual “contingency contacting.” Food and drink is constantly presented to the individual’s mouth until it opens up enough to place food inside the mouth. This combination requires positive

reinforcement as soon as a bite or drink enters the child's mouth. Using this combination, allows children with chronic, persistent food refusal, to maintain bite acceptance more effectively than positive reinforcement alone (Hoch et al., 2001).

Behavioral Feeding Techniques. In a study completed by Gentry & Luiselli (2007), a subject was given a chart to make him/her aware of how many bites were expected during that session. Expectations helped the subject perform feeding exercises more successfully. A reward chart was also given to the subject when the appropriate number of bites was accepted. The subject was allowed to participate in a preferred activity when s/he had completed one section of that reward chart. Results of this study showed an increased number of bites of non-preferred foods in two intervention phases, and after treatment was complete. Luiselli (2000) discussed using "reward time" when the participant successfully accepted bites of food. During "reward time," the participant was given access to highly preferred toys. The participant only had access to these toys following appropriate bite acceptances. The researcher put a card next to the participants bowl, showing the exact number of expected bites of food. The participant was praised after each bite was taken. Following each bite, a number was marked off, indicating how many more bites of food had to be eaten before "reward time" was earned. The method used in this study is similar to the use of a bite chart in that it involves positive reinforcement and a set number of bites. Modeling has also been found to be a successful method, since young children are prone to imitate (Kerwin & Eicher, 2004). Presenting only one food at a time is another strategy for treatment according to Ahearn (2002). If food is presented one bite at a time, the child may not get over stimulated or overwhelmed with all that has to be eaten.

Changing the setting/environment for eating is a new area of interest for pediatric feeding disorders (Ahearn, 2002). Gentry & Luiselli (2007) used a naturalistic environment and parent

training to improve food acceptance in one subject. Bite acceptance was maintained after treatment was completed. Fraker and Walbert (2003) recommend making mealtime a positive environment, as well as providing motivators and reinforcers for the child to use when positive feeding behaviors occur.

Functional behavioral analysis. Antecedent and consequence manipulations are factors in functional analysis. In this analysis, behaviors prior to the event (antecedent) and following the event (consequences) are analyzed to determine the reason it happened. The event, or behavior, itself is also analyzed. These analyses are documented and monitored to identify patterns of behaviors and the reason why they occur. It also analyzes the environment and other behaviors such as aggression

Desensitization. Desensitization is a method of providing stimulation to increase awareness of the oral and facial areas. This is done with tactile stimulation (finger stroking) first around the face and then moving into the oral area. Once tactile stimulation is accepted, the nipple of a bottle is used to provide additional stimulation around the oral cavity. During the next phase of desensitization, milk is introduced using a finger. After the milk is accepted, a nipple is placed on the child's lips, indicating the client has been desensitized. (Ramsay & Zelazo, 1988). This example is for bottle feeding; however, the same principles can be applied to self-feeding. First, desensitization for the oral and facial areas is done with a spoon. When the spoon is accepted, food is placed on it and then presented to the child.

Food chaining. Food chaining is a six step procedure developed by Fraker (2007) to expand an 11 year-old client's repertoire of food. Fraker developed the plan when her client asked if pizza sauce and spaghetti sauce tasted the same. Fraker decided to try to introduce the

client to foods that were similar to his accepted foods (peanut butter, white bread, and milk). After working with a team of professionals, Fraker implemented this program and was able to expand the client's repertoire from "5 foods to 150 in three months" (Fraker, Fishbein, Cox, & Walbert, pg XXVI).

The first five steps of the program are designed to sort through the client's history and determine the cause of the food aversion. These steps examine medical conditions, food allergies, oral motor deficits, sensory difficulties, and negative meal time behaviors. During these five steps, professionals that the client and his/her family may visit include: pediatric dietitian, occupational therapist, pediatric speech-language pathologist, and behavioral psychologist. These professionals assist in gathering the needed information to implement the rest of the program. After all of these steps have been completed, a feeding team examines the information and determines the reason for the feeding problem. After the problem has been determined, the process of food chaining begins (Fraker et al., 2007).

The feeding team determines the commonality in the foods the child accepts at the beginning of step six. Using this information, the feeding team will slowly introduce a child to new foods by matching the taste, texture, temperature, or appearance to a previously accepted food. As the child begins to accept new foods, the team will slowly introduce new tastes or textures. Throughout this process, the child is encouraged to express his/her opinion about the food. The child is given a rating scale in order to rate how much they liked a particular food. The goal of this program is to expand the client's food repertoire enough, so they can participate in social situations or maintain a healthy diet. The goal is not to have the child like every food. The food chaining process is usually conducted at home with a child's parents, but a speech-language pathologist (SLP) is often working with the family in order to facilitate this process.

“Most parents see significant improvements in their child’s eating habits within three months”

(Fraker et al., pg XXX).

Professionals who Address Behavioral Feeding Disorders

Behavioral feeding intervention requires multiple team members. They often include a SLP, physical therapist, occupational therapist, and behavior analyst. According to Kerwin and Eicher (2004), the SLP is responsible for assessing oral-motor skill and function, facial muscle tone, lateralization of the tongue, and oral transport. The physical and occupational therapists are responsible for assessing gross motor tone and function, ensuring correct positioning during feeding, and maximizing trunk rotation. The behavior analyst is responsible for conducting functional behavior analyses and developing treatments for food refusal. Goals are identified and prioritized by the team.

Other team members often include a developmental pediatrician, a nutritionist, and pediatric subspecialists. The developmental pediatrician assesses medical factors that could contribute to food refusal. S/he obtains a complete medical and developmental history of the individual and completes a physical examination. The nutritionist is responsible for creating a plan for targeting specific foods and monitoring the child’s nutrition. According to Linscheid (2006), the pediatric psychologist is responsible for behavioral treatment. Pediatric subspecialists, such as gastroenterologists and endocrinologists, are also members of the team. In order to provide the best care possible for children with behavioral feeding disorders, all team members must agree, have working relationships with one another, and be willing to make a referral, when necessary.

Bite Chart

A bite chart is a positive reinforcer used during behavioral feeding intervention. Currently, there is not a published definition for a bite chart. During this study, a bite chart was constructed using a manila file folder divided into four quadrants. Each quadrant contained a piece of Velcro, which had a corresponding picture.

At the beginning of the presentation, all four pictures were either attached to the folder or set on the table. Each time the child took a bite, they were allowed to pull off or put on one of the pictures. The bottom of the folder contained an extra piece of Velcro, which was used to attach a picture of a motivating activity. The client was able to participate in the motivating activity only when s/he had accepted all four bites. The child was encouraged to choose the activity before intervention begins. This type of intervention was especially effective if the parents do not allow access to this preferred activity or toy outside of feeding intervention. If all four bites were not accepted, the child was not allowed access to the motivating activity or toy.

A bite chart is similar to the card used in Luiselli's (2000) study which was discussed previously. The bite chart helps the child understand the expectations for feeding while making the activity motivating and enjoyable. Fraker et al. discussed setting expectations for a child in order to decrease inappropriate behaviors during meal time. A bite chart sets visual expectation for the child. The child knows that s/he must take four bites before they can participate in the preferred activity. Fraker et al. also discussed using a sticker chart or game as a reinforcer to encourage children to participate in mealtime. They also stated that a sticker chart motivates children by giving them something to work toward. The preferred activity at the bottom of the

bite chart is used in the same way. The child knows that once they take all four bites, they will be able to participate in that activity.

Summary

Many behavioral interventions are used during behavioral feeding therapy according to the previously discussed articles. Behavioral intervention is the basis for the successful techniques used during feeding therapy. In this study, the researchers are interested in researching the effectiveness of bite charts as a positive reinforcer in behavioral feeding therapy. A bite chart is a positive reinforcer used in behavioral therapy as a way to motivate the child to take bites of food. The food chaining process will be used indirectly during this study. The researchers did not collect data on the food chain; however, the food chain was used to determine the target foods for data collection. SLPs implement bite charts in behavioral feeding intervention as a positive reinforcer; however, no research has been conducted on the effectiveness of bite charts. This provides rationale for our current study, to investigate the following research question: Does the use of bite charts, a method of positive reinforcement in behavioral feeding intervention, increase willingness to taste non-preferred foods?

CHAPTER II

METHODS

Subjects

The two subjects, Leo and Jasmine, used in this study were in therapy to address behavioral feeding concerns. Leo, a 6-year, 2-month-old-male, had concomitant diagnoses of Down syndrome, expressive and receptive language deficits, and a behavioral feeding disorder. The SLP used food chaining to determine which foods to target in therapy, as well as a bite chart for reinforcement.

Leo's mother reported that he eats hotdogs, chicken nuggets, SpaghettiO's, ravioli, and macaroni and cheese. He eats any type of canned fruit or vegetable and drinks milk, juice, and water. Leo's mother wanted him to eat mixed textured foods (e.g. birthday cake, chips, crackers etc.) which were being targeted in therapy.

Leo's refusals included saying "no," crossing his arms, or walking away when unknown or non-preferred foods were presented. Leo's mother also reported that he pokes and smells food before he tries it. The bite chart was implemented at home and Leo independently used it when he did not want to try a new food. He understood that he must take four bites to complete each food trial. Mom reported that the bite chart relieved the pressures of eating.

Jasmine, a 2-year, 10-month-old-female, had no medical diagnosis and consulted a SLP for behavioral feeding therapy only. The SLP reported that Jasmine had a mild speech delay which was not a significant concern. Therefore, the SLP primarily targeted behavioral feeding using a bite chart while incorporating speech and language goals within the preferred activities.

The SLP reported that Jasmine could go a whole day without eating, likely due to her excessive milk consumption. Food consumption varied daily depending upon Jasmine's mood and/or willingness to eat. The SLP reported that Jasmine's diet might include half a cup of cereal, a few bites of macaroni and cheese or mashed potatoes, and chips or other junk food (candy). The only meat that Jasmine ate was thinly sliced deli meat. She liked to drink juice, but was not allowed to have much of it due to the lack of nutritional value and amount of sugar.

At meal time, foods were presented one at a time to prevent Jasmine from becoming overwhelmed. When Jasmine tried unknown food in therapy, she consistently reported that the food was yummy even with a bitter expression on her face. When Jasmine refused to eat food, she said "no" or "don't want" and smashed and threw the food on the floor. In therapy, she was taught to smash food to inspect its texture. The therapist then encouraged her to lick and taste the food.

Equipment

In this study, a bite chart was used as positive reinforcement when the appropriate number of bites was taken by each subject. Each SLP provided the clients with a table and chair, and used silverware, plates, and bowls. Participants were given a drink of water to rinse out their mouths when foods changed. Parents provided food for the therapy sessions based on personally chosen target foods or the food chaining recommendations made by the SLP. A sample bite chart is provided in Appendix A.

Procedures

Subjects were recruited based upon the recommendation of a local SLP. Subject selection criteria included age, diagnosis, attention span, and sensory aversions. The subjects needed to be between two years, six months and eight years of age. They were diagnosed with a feeding disorder based on DSM-IV-TR criteria. An attention span of at least ten minutes was required of each subject. Children with moderate to severe sensory aversions were not included in this study due to the nature of their feeding problem. A consent form was signed by each subject's parents (Appendix B). The researchers also required each subject to give assent (Appendix C). The subjects' anonymity was protected through the use of pseudonyms. The researchers obtained approval for the study through Eastern Illinois University's Internal Review Board (Appendix D).

This study examined the effects of a bite chart on behavioral feeding intervention. The researchers employed a single subject BAB design for the study. The researchers implemented a period of treatment, a withdrawal phase, and then reinstated the treatment. Before implementing the withdrawal phase, the researchers required three similar baseline measures.

Once the subjects established stable baseline measures in the treatment phase of this study, the researchers withdrew the bite chart. The researchers provided a script for the SLP to use during the sessions (Appendix E). The script provided definitions for bite acceptance, bite refusal, and allowable cues.

During an intervention module, the SLP presented four bites of a given food. The SLP placed the food in front of the subject. If the subject did not independently place a bite of food into his/her mouth, the SLP gave the first prompt and waited to see if the subject then accepted the

bite. If the bite was still not accepted, the SLP then provided the second prompt, and again allowed the child time to accept the bite of food. If the bite was not accepted after the second prompt, the SLP then gave the third prompt. If after three prompts the food was not accepted, the trial was considered a refusal. During baseline measures and when treatment was reinstated, the subject was instructed to remove or add one piece of the bite chart each time a bite was accepted. After all four pieces of the bite chart were removed or added, the client was allowed to participate in a preferred activity. Multiple intervention modules were completed during each therapy session.

Data analysis

The main purpose of this study was to determine if a bite chart assisted children with behavioral feeding disorders to accept new foods. Data collected during all trial phases included the number of bite acceptances per intervention module. Data were configured for visual inspection. Graphs were created to display the number of bite acceptances per intervention module for each subject.

The manipulated independent variable in this study was the use of the bite chart during therapy sessions. The researchers controlled the use of the bite chart by choosing the BAB study design. The removal and reinstatement of the bite chart was determined by the subject achieving stable measures. The assigned independent variables include the subject's age, previous use of the bite chart, and previous therapy. The subjects used for this research study were chosen based on availability, although their ages were not the same. The researchers chose a BAB study design based on the fact that both clients were currently using a bite chart; however, the researchers did not know how long each client had been using the bite chart. The researchers also knew that both

subjects had received previous feeding therapy; but, the length of therapy time was not controlled.

Multiple confounding variables appeared during the study. Bite acceptance was highly dependent on whether or not the subject had eaten before therapy began. The subject's mood also played an integral role on the number of bites accepted. The final confounding variable was a previous medical diagnosis. The dependent variable in this study was the number of bites accepted during each intervention module. The researchers provided a definition for a bite acceptance and a bite refusal in order to aid in the collection of the data.

Reliability and Validity

To assess reliability, inter-rater reliability was measured for both subjects between the researchers and the SLP. For Jasmine, one researcher and the SLP observed the feeding session and collected data. The percentage of agreement between the two recorders was 100%. For Leo, both researchers and the SLP took data and there was 95% inter-rater reliability. To guarantee reliability between the researchers and SLPs, a data sheet was created. Behaviors were explicitly defined to allow reliability of the data collection.

To ensure for validity, a cueing hierarchy was created and given to each SLP and the researchers in order to determine the number of cues needed prior to a bite acceptance. Also, this guaranteed that each subject's therapy session was conducted similarly and each SLP understood their task. The researchers compared data with the SLPs 20% of the study in order to confirm validity and reliability of the results. With the research design used, withdrawing the bite chart allowed the results to be attributed to the treatment. The researchers tried to replicate the results across subjects, but due to time constraints, replication was unsuccessful.

CHAPTER III

RESULTS

The results of this study indicated that the bite chart was effective in behavioral feeding intervention. During the initial baseline phase, both subjects accepted four bites and were reinforced with a preferred activity. In the withdrawal phase, Leo, decreased to zero bites and demonstrated negative behaviors toward trying new foods. Leo's progress was displayed in Figure 1. Jasmine's data fluctuated between accepting two, three, or four bites. Jasmine's progress during the withdrawal phase was displayed in Figure 2. During this phase, refusals were exhibited from both participants. Leo had three trial refusals without the bite chart and Jasmine had four bite refusals during the two sessions without the bite chart. Both participants were reinforced when each trial was completed. When the bite chart was reintroduced, both subjects accepted four bites during each trial. The participants were willing to try the provided foods, even ones that were refused during the withdrawal phase.

The bite chart relieved the anxiety associated with eating because it was a visual cue or a reminder for Leo and Jasmine to take a bite. Visual cues were another method to use rather than always verbally cueing them. For Leo and Jasmine, the bite chart made them feel as if they had control of how many bites they were going to eat before that trial was over. For Leo, visuals were more effective than verbal cues, because the visual cues were always there and could be referred to when needed. When the visual was withdrawn, negative behaviors were noted and refusals continually occurred. For Leo when the bite chart was withdrawn, he refused everything but a few bites. Leo also demonstrated negative behaviors that the researchers had not previously seen. Even with the SLP's verbal prompts "take a bite" or "it's good, try it" or "I'll try it first

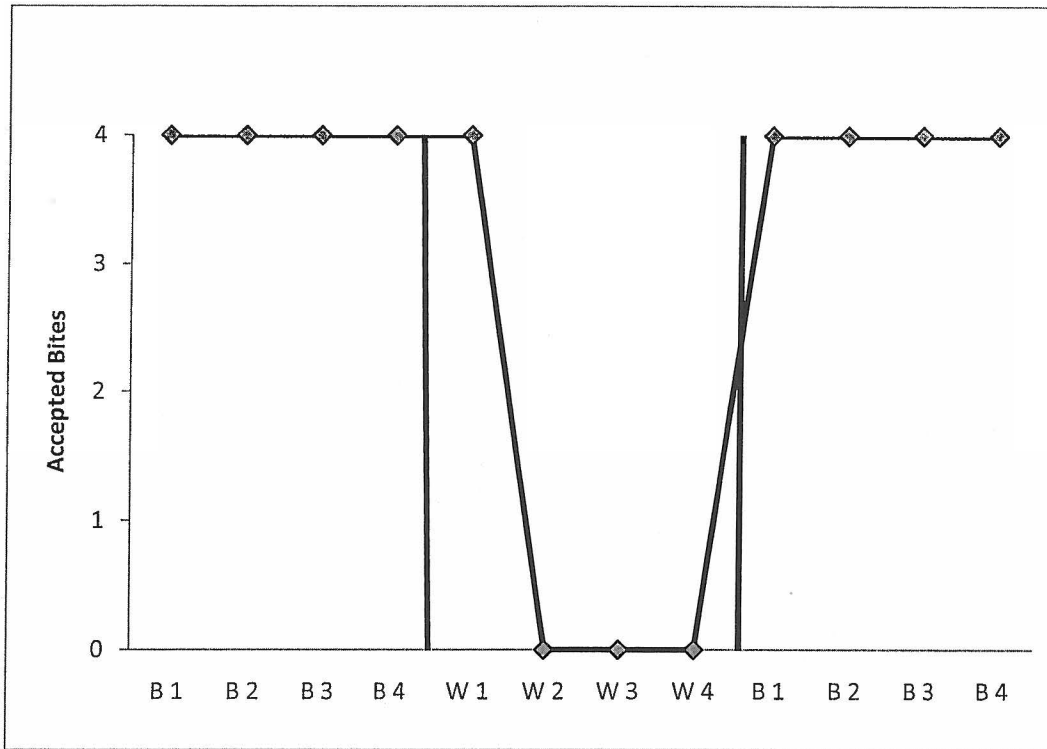


Figure 1. Leo's Progress Chart.

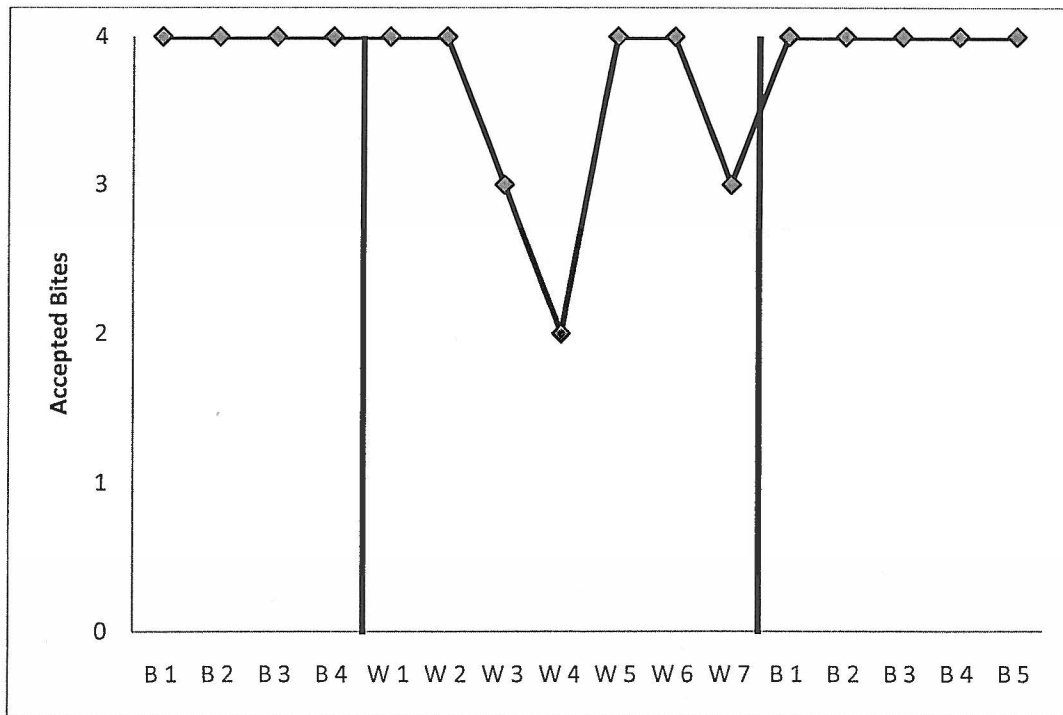


Figure 2. Jasmine's Progress Chart

and then you try it," Leo did not participate in the trial. Leo needed the visual cue to remind him of the expectation of how many bites he needed to take. Jasmine demonstrated negative behaviors when the bite chart was withdrawn as well. She would smash the food and throw it on the floor.

CHAPTER IV

Discussion

During the withdrawal phase, the performance of both subjects decreased, which indicated the need for the bite chart. Leo's performance dropped significantly, but Jasmine's performance was inconsistent. Age was one factor that might have affected the results of the study. Jasmine was only two years, ten months old and may not have fully understood the cause and effect relationship associated with the bite chart. Leo, on the other hand, was six years old and was able to recognize the cause and effect relationship. Leo also had a concomitant diagnosis of Down syndrome, which might have made him more reliant on visual stimuli. Jasmine did not have a concomitant diagnosis and therefore, might not have been as reliant on visuals. Jasmine's performance was also highly impacted by her mood and previous caloric consumption. Jasmine accepted more bites when she had not eaten breakfast or consumed large amounts of milk before the therapy session began. Jasmine could not be persuaded to eat on days when she absolutely refused.

Food determination may have impacted the success of the subjects. Leo's target foods contained mixed textures; however, no specific texture was targeted for Jasmine. The researchers observed Jasmine eating soft textured foods (canned peas and carrots, cooked carrots, and peaches). Leo used a food chaining program during the session. Because of this program, he was required to try four new foods each therapy session; therefore he knew he was done with a food after four bites were accepted. Jasmine did not use a food chaining program; rather her foods were selected by her family. It was noted that Jasmine ate familiar foods and Leo ate unfamiliar foods during the study. Jasmine's therapy sessions were based around the consumption of only one or two different foods.

Leo's success may also be contributed to the use of the bite chart at home. Leo's mother reported that he frequently brings his bite chart to the table at home when asked to try a new food. Jasmine did not use the bite chart at home and therefore, had been required to try a new food without the use of the bite chart in the past. Leo's parents did not force Leo to eat, but would not give him preferred foods until the new food was trialed with the bite chart. Leo's parents reported that Leo often enjoyed new foods after he tried them using the bite chart. It was reported that in order to maintain nutrition, Jasmine was given preferred foods when she refused unfamiliar foods. The level of parental commitment towards the consumption of new foods may impact a child's willingness to try them. Overall, results of this study indicate that a bite chart is an effective form of positive reinforcement; however, implementation needs to be based on the needs of the individual.

Each research subject was seen in a different environment and this might have impacted their performance. Leo received outpatient services, whereas Jasmine received in-home services. Having a positive environment where the expectation was consistent might increase bite acceptance. On the other hand, inconsistent expectations in an environment might cause confusion and lack of cooperation for the children. Conducting therapy in a less familiar environment may cause children to be on their "best behavior" since they are not in the comfort of their own home.

Food presentation may also contribute to bite acceptance. While seated at the table, both subjects were presented with multiple foods on their plate. However, in therapy, the foods were presented individually. Due to this difference, the subjects might have been more willing to accept bites during therapy. This was consistent with Ahearn's (2002) findings. The ratio of preferred to non-preferred foods might have impacted feeding. The research discussed earlier

shows that using two preferred foods and one non-preferred food at a time is recommended. It also recommended eating the two preferred foods prior to eating the non-preferred food (Gentry and Luiselli, 2007).

Strengths

One strength of this study was the withdrawal phase. The withdrawal phase allowed success of bite acceptance to be attributable to the bite chart. Without the withdrawal phase, the researchers would not have been able to claim the cause and effect relationship between bite acceptance and the use of the bite chart. Another strength of the study was that inter-rater reliability was calculated for each subject. These calculations resulted in 95% and 100% compatibility. These results indicated consistency in data collection among two different SLPs and the researchers. Furthermore, using two subjects in this study proved to be a strength. This allowed the researchers to show the effectiveness of a bite chart across multiple populations (e.g. age, gender, and diagnoses).

Limitations

One limitation of this study was the inconsistency between subjects. The diagnosis of a behavioral feeding disorder was the only similarity between the subjects. The discontinuity between the subjects may have contributed to the differing results. Due to this factor, the researchers would caution the generalization of these results. Another limitation of this study was the time constraint, which limited data collection. Jasmine was not able to achieve a stable measure during the withdrawal phase; however her data showed a decrease. Leo was only able to participate in the withdrawal phase during one therapy session. If the withdrawal phase could have been completed over multiple sessions, the data would be stronger either confirming or rejecting the effectiveness of the bite chart. The presence of multiple confounding variables was

another limitation. The researchers found that previous consumption of food or drink and the subject's mood impacted the number of bites accepted. The researchers did not control for concomitant diagnoses, but noted that a concomitant diagnosis might impact the need for the bite chart. This might be due to the need for multi-modality teaching. Further limitations include inconsistency in the therapy settings. Leo was seen outside his home; however, Jasmine was seen in her home. The difference in setting might have contributed to the subject's performance.

Future Research

The area of feeding does not have a significant amount of research; therefore further research in any area of feeding is needed. The subjects who participated in this study benefited from the use of the bite chart; however, some changes are needed when conducting future research. These changes include a larger number of subjects who are matched based on diagnoses as well as expanding the age range. Future research should also include a phase conducted in the subject's home in order to provide a more natural setting. This might also increase generalization and carry-over. Another recommendation for future research would be to use a stronger research design, such as ABA.

Ongoing research is needed to address a series of questions raised by this study. Jasmine's performance was not as reliable as Leo's; therefore, future researchers should answer the question: Are children under the age of three too young to benefit from the use of a bite chart? Leo's concomitant diagnosis of Down syndrome may have impacted his performance, so future research might ask the question: Do concomitant diagnoses impact the need for a bite chart? The current study only addressed behavioral feeding disorders, but many children also experience sensory feeding disorders. Future research might ask the question: Are bite charts effective for sensory feeding disorders? Leo's performance was different from Jasmine's and that

might have been due to the use of the food chaining program. Food chaining is used for many different reasons, but future research might ask: Does food chaining impact the effectiveness of a bite chart?

Conclusions

Through the use of a withdrawal phase, the researchers were able to prove the effectiveness of the bite chart on the acceptance of non-preferred foods. Although the subject's results were not identical, bite acceptance decreased when the bite chart was withdrawn. This study proved that a bite chart is effective for a small population of subjects; therefore, future research is needed to understand who benefits from a bite chart and when it is effective.

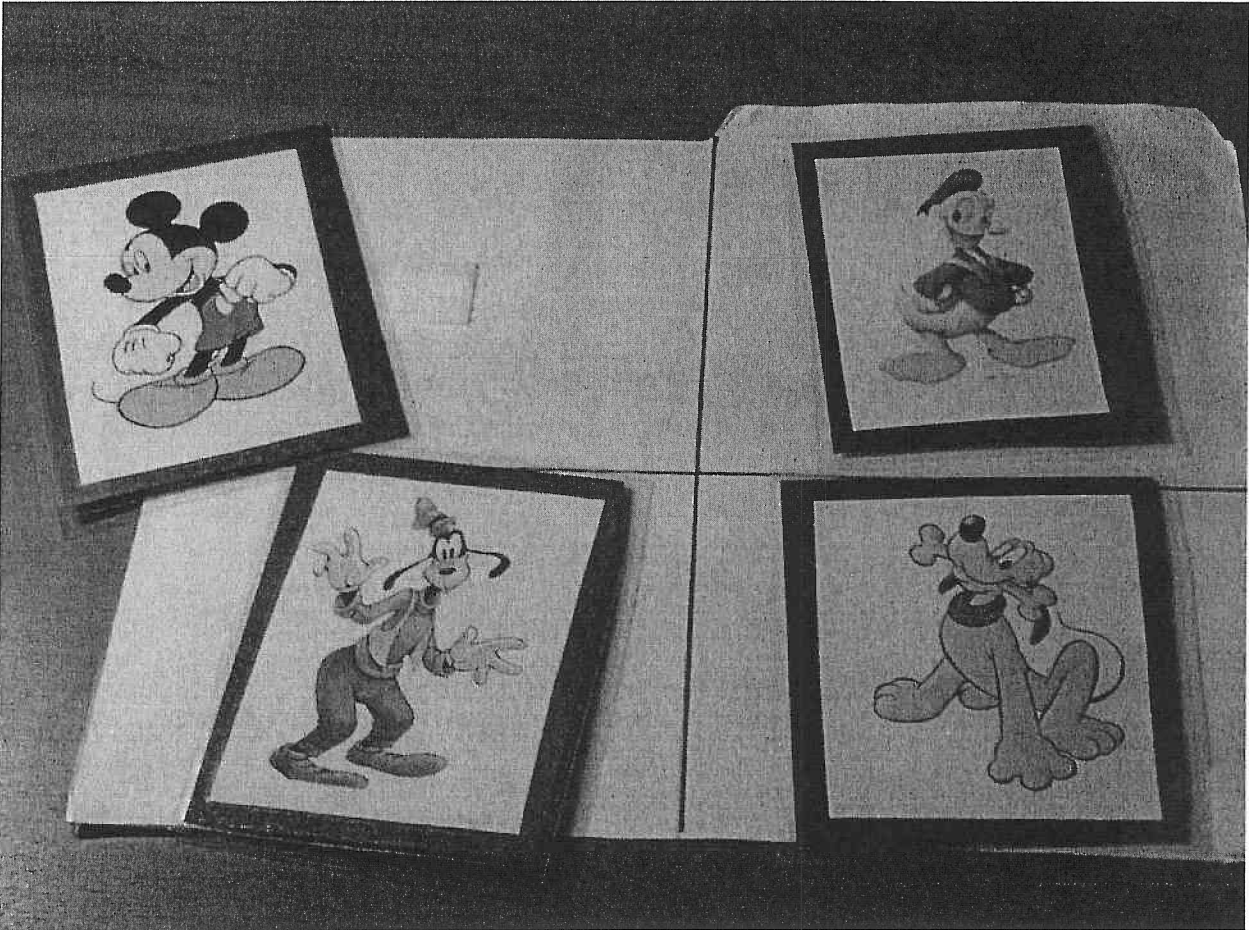
References

- Ahearn, W.H. (2002). Effect of two methods of introducing foods during feeding treatment on acceptance of previously rejected items. *Behavioral Interventions*, 17, 111-127. doi: 10.1002/bin.112
- American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision*. Washington, DC: American Psychiatric Association.
- Casey, S.D., Cooper-Brown, L.J., Wacker, D.P., & Rankin, B.E. (2006). The use of descriptive analysis to identify and manipulate schedules of reinforcement in the treatment of food refusal. *Journal of Behavioral Education*, 15 (1), 41-52. doi: 10.1007/s10864-005-9001-7
- Casey, S.D., Perrin, C.J., Lesser, A.D., Perrin, S.H., Casey, C.L., & Reed, G.K. (2009). Using descriptive assessment in the treatment of bite acceptance and food refusal. *Behavior Modification*, 33, 538-558. doi: 10.1177/0145445509341457
- Fishbein, M., Cox, S., Swenny, C., Mogren, C., Walbert, L., & Fraker, C. (2006). Food chaining: A systematic approach for the treatment of children with feeding aversion. *Nutrition in Clinical Practice*, 21, 182-184. doi: 0884-5336/2102-0182\$03.00/0
- Fraker, C., Fishbein, M., Cox, S., & Walbert, L. (2007). *Food chaining*. New York: Marlowe Company.
- Fraker, C., & Walbert L. (2003). *Evaluation and treatment of pediatric feeding disorders: From NICU to childhood*. Temecula, California: Speech Dynamics Inc.
- Gentry, J.A., & Luiselli, J.K. (2007). Treating a child's selective eating through parent implemented feeding intervention in the home setting. *Journal of Developmental Physical Disabilities*, 20, 63-70. doi: 10.1007/s10882-007-9080-6
- Hillman, H.L. (2006). Functional analysis and food refusal: A brief review. *The Behavior Analyst Today*, 7 (1), 48-55.
- Hoch, T.A., Babbitt, R.L, Farrar-Schneider, D., Berkowitz, M.J., Owens, J. C., Knight, T.L., Snyder, A.M., Rizol, L.M., & Wise, D.T. (2001). Empirical examination of a multicomponent treatment for pediatric food refusal. *Education & Treatment of Children*, 24 (2), 176-198. ISSN: 0748-8491
- Kedesdy, J., & Budd, K. (1998). *Childhood feeding disorders*. Baltimore, MD: Brookes.

- Kerwin, M.E. (2003). Pediatric feeding problems: A behavior analytic approach to assessment and treatment. *The Behavior Analyst Today*, 4 (2), 162-176.
- Kerwin, M.E., & Eicher, P.S. (2004). Behavioral intervention and prevention of feeding difficulties in infants and toddlers. *Journal of Early and Intensive Behavior Intervention*, 1 (2), 129-140.
- Linscheid, T.R. (2006). Behavioral treatments for pediatric feeding disorders. *Behavior Modification*, 30 (1), 6-23. doi: 10.1177/0145445505282165
- Luiselli, J.K. (2000). Cueing, demand fading, and positive reinforcement to establish self-feeding and oral consumption in a child with chronic food refusal. *Behavior Modification*, 24 (3), 348-358. doi: 10.1177/0145445500243003
- Ma, H.H. (2009). Comparisons of the relative effectiveness of different kinds of reinforcers: A PEM approach. *The Behavior Analyst Today*, 10 (3&4), 398-427.
- Nextext. (2001). Introduction to Psychology. Illinois: McDougal Littell. P. 102-103.
- Ramsay, M. (1988). Food refusal in failure-to-thrive infants: Nasogastric feeding combined with interactive-behavioral treatment. *Journal of Pediatric Psychology*, 13 (3), 329-347. doi: 0146-8693/88/0900-0329\$06.00/0
- Tewes, L. (2007). Early intervention for children with autism: Methodologies critique. *Developmental Disabilities Bulletin*, 35 (1&2), 148-168.
- Thompson, S.D., Bruns, D.A., & Rains, K.W. (2010). Picky eating habits or sensory processing issues? Exploring feeding difficulties in infants and toddlers. *Young Exceptional Children*, 13 (2), 71-85. doi: 10.1177/1096250609351805

Appendix A

Sample Bite Chart



Appendix B

CONSENT TO PARTICIPATE IN RESEARCH

Effectiveness of Bite Charts in Behavioral Feeding Intervention

Your child is invited to participate in a research study conducted by Natalie Gray, Melissa Council, and Dr. Tina K. Veale, from the Communication Disorders and Sciences department at Eastern Illinois University. Your child's participation in this study is entirely voluntary. Please ask any questions about anything you do not understand, before deciding to allow your child to participate.

- **PURPOSE OF THE STUDY**

The purpose of this study is to determine the effect of bite charts as positive reinforcement during behavioral feeding intervention. A bite chart is constructed from a manila folder which has been divided into four quadrants. Each quadrant will contain a sticker which will be attached by Velcro. When a bite is accepted, the client will be allowed to remove one sticker. After all four stickers are removed; the client will be allowed to participate in a motivating activity. After each bite, the client will be required to rate the bite on a scale of 1-5, which is represented by smiley faces.

- **PROCEDURES**

If you volunteer your child to participate in this study, s/he will be required to do the following:

The researchers are doing an ABA research design at Eastern Illinois University and a BAB research design at Sarah Bush Lincoln Health Center. For an ABA design, the clinician will begin by asking the participant to take bites of non-preferred foods without using the bite chart. After the participant has eaten the same number of bites for three presentations, the clinician will introduce the bite chart. The bite chart will be used as a reinforcer for the participant to take bites of foods they would not otherwise try. The bite chart will be used until the participant's data is consistent for three therapy sessions. After the participant's measurements are consistent, the bite chart will be removed from the session. The clinician will again try to get the client to try new foods without the bite chart.

For a BAB design, the clinician will begin by using the bite chart to take bites of non-preferred foods. After the participant has eaten the same number of bites for three presentations, the clinician will remove the bite chart. The clinician will then ask the

participant to take bites of non-preferred foods. The bite chart will be reinstated when there is a decrease in the number of bites for three presentations. Once the bite chart has been reinstated, the number of bites should increase.

Therapy will be on a continuum starting with touch, moving to smell, then lick, and finally taste. The therapist will place the participant in the appropriate phase before data collection begins. The participant will work toward the next phase throughout the study.

- **POTENTIAL RISKS AND DISCOMFORTS**

Overall risks are considered minimal. Participants may choke, swallow food into their airway, or have an allergic reaction to the test food. Therapists at both locations are trained to address these issues should they arise.

- **POTENTIAL BENEFITS TO SUBJECTS AND/OR SOCIETY**

The participant may benefit in an expanded diet. The benefit to society includes helping children with feeding disorders increase the variety of food they eat.

- **CONFIDENTIALITY**

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of storing test data in a filing cabinet in a locked office at the EIU Speech-Language-Hearing Clinic. When presenting results of the study, pseudonyms will be used to protect the identity of the participants.

- **PARTICIPATION AND WITHDRAWAL**

Participation in this research study is voluntary and not a requirement or a condition for being the recipient of benefits of services from Eastern Illinois University or any other organization sponsoring the research project. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind or loss of benefits or services to which you are otherwise entitled.

You may also refuse to answer any questions you do not want to answer. There is no penalty if you withdraw from the study and you will not lose any benefits to which you are otherwise entitled.

- **IDENTIFICATION OF INVESTIGATORS**

If you have any concerns or questions about this researcher, please contact Natalie Gray at 217-343-0963, Melissa Council at 217-415-4675, or Tina K Veale at 217-581-2712, EIU Speech-Language-Hearing Clinic, 600 N. Lincoln Ave, Charleston, IL 61920.

• **RIGHTS OF RESEARCH SUBJECTS**

If you have any questions or concerns about the treatment of human participants in this study, you may call or write:

Institutional Review Board

Eastern Illinois University

600 Lincoln Ave.

Charleston, IL 61920

Telephone: (217) 581-8576

E-mail: eiuirb@www.eiu.edu

You will be given the opportunity to discuss any questions about your rights as a research subject with a member of the IRB. The IRB is an independent committee composed of members of the University community, as well as lay members of the community not connected with EIU. The IRB has reviewed and approved this study.

I hereby consent to the participation of _____, a minor/subject in the investigation herein described. I understand that I am free to withdraw my consent and discontinue my child's participation at any time.

Signature of Minor's Parent or Guardian

Date

We, the undersigned, have defined and fully explained the investigation to the above subject.

Signature of Investigator

Date

Signature of Investigator

Date

Appendix C

Assent to Participate in Research

Due to the age of the participants, a written statement to read would not be appropriate. Instead of a written statement, after explaining what we are doing, we will simply ask the child if he/she would like to participate, and if he/she does not want to, they can stop at any time and that it will be perfectly fine for them to do so. In detail we will hold to the following timeline:

1. Introduce ourselves
2. Tell the child we have some food for them to eat and ask them if they want to see what we will be eating.
3. Tell the child their parents have given their permission for you to take part in this study. Even though your parents said "yes," you can still decide not to do this.
4. Tell the child he/she can ask any questions that he/she has about the study. If you have a question later that you didn't think of now, you can call us, your parents have our phone numbers (217)343-0963 (Natalie) and (217)415-4675 (Melissa) or ask us next time.
5. Ask the child if he/she would like to participate, stressing that it is ok if they do not want to.

Would you like to come with me and participate in the study?

Yes

No

We will also be using the judgment of ourselves, the student clinician or licensed speech language pathologist and any faculty nearby and will immediately stop the experiment if the child is upset or uncomfortable at any time. For instance, if the child refuses to take a bite, begins to choke or aspirate, or stands up and leaves the activity we will terminate the process with the child. This project is undertaken with the direct supervision of Dr. Veale. The families of the children will have granted consent for their child's participation as well.

Appendix D**Institutional Review Board (IRB) Approval****Form A**

Eastern Illinois University

Institutional Review Board

NEW APPLICATION FOR REVIEW OF RESEARCH INVOLVING HUMAN SUBJECTS

Federal regulations and Eastern Illinois University's IRB policy require that all research involving humans as subjects be reviewed and approved by the University's Institutional Review Board (IRB) prior to the commencement of the data collection. Approval of this project by the IRB only signifies that the procedures adequately protect the rights and welfare of the subjects.

1. Title of Project: Effectiveness of Bite Charts in Behavioral Feeding Intervention
2. Principal Investigator*: Natalie Gray, B.S.

Melissa Council, B.S.

Status: Faculty Student* EAP Staff Other—specify: _____

*Note: Students engaging in research are required to have a faculty sponsor or executive, administrative, or professional (EAP) staff sponsor. List sponsor below.

Tina K. Veale, Ph.D., CCC-SLP

Mailing address: Department of Communication Disorders and Sciences

Eastern Illinois University
Human Services Center
600 Lincoln Avenue
Charleston, IL 61920

Phone: (217)581-2712 E-mail: nlgray@eiu.edu

Department or Unit Communication Disorders and Sciences

Has PI completed CITI training? Yes No

Prior to IRB approval, all PI's, Co-PI's, and sponsors must complete the CITI Program training

Co-Investigator or Sponsor: Dr. Veale

Status: Faculty Student EAP Staff Other—specify: _____

Mailing address: Department of Communication Disorders and Sciences

Eastern Illinois University
Human Services Center
600 Lincoln Avenue
Charleston, IL 61920

Phone: 217-581-2712 E-mail: tkveale@eiu.edu

Department or Unit Communication Disorders and Sciences

Has Co-PI or sponsor completed CITI training? Yes No

List additional co-investigators, including above information, on a separate sheet.

Name: Melissa Council

Mailing Address: Department of Communication Disorders and Sciences

Eastern Illinois University
Human Services Center
600 Lincoln Avenue
Charleston, IL 61920

Phone: (217) 581-2712 Email: macouncil@eiu.edu

3. Level of Review Sought: Exempt (submit Form B) Expedited (submit form C)
Full Committee

4. Is this research being conducted to meet requirements of a course or to complete an academic degree?

Yes (do NOT submit your dissertation or thesis proposal) No

5. Estimated Project Starting Date: August 2010

Estimated Project Completion Date: December 2010

6. Extramural Funding:

Principal Investigator of Contract or Grant: NA

Funding Source: NA

Contract or Grant Title: NA

Contract or Grant Number: NA

7. Indicate the categories of subjects and controls to be included in the study: Check ALL that apply:

- | | | | |
|-------------------------------------|---|-------------------------------------|----------------|
| <input type="checkbox"/> | Abortuses/Fetuses | <input checked="" type="checkbox"/> | Patients |
| <input type="checkbox"/> | Decisionally Impaired | <input type="checkbox"/> | Prisoners |
| <input type="checkbox"/> | Decisionally Impaired (Institutionalized) | <input type="checkbox"/> | Pregnant Women |
| <input checked="" type="checkbox"/> | Minors (17 yrs or less)—Give age range: 4-6 | <input type="checkbox"/> | Students |
| <input type="checkbox"/> | Normal Volunteers | | |

8. Approximate number of human subjects: 2-4

9. Indicate which of the categories listed below accurately describes this protocol:

- Not greater than minimal risk
- Greater than minimal risk, but presenting the prospect of direct benefit to individual subjects
- Greater than minimal risk, no prospect of direct benefit to individual subjects, but likely to yield generalizable knowledge about the subject's disorder or condition
- Research not otherwise approvable, but presents an opportunity to understand, prevent, or alleviate a serious problem affecting the health and welfare of subjects

10. Does this research involve any of the following? (Check all that may apply)

- Past, present, or future physical health of the participants
- Mental health (as defined in DSM-IV TR)
- Provision of health care to the participants
- Past, present, or future payments for the provision of health care to the participants

If any of the above categories are checked, please refer to Appendix 4, HIPAA Information, in the EIU Policy and Procedures for the Review of Research Involving Human Subjects

11. Will a public use data file be created? Yes No

12. Complete all items from the Research Description section, which follows this application form.

Investigator Assurance

I certify that the information provided for this project is correct and that no other procedures will be used in this protocol. I agree to conduct this research as described in the attached supporting documents. I will request approval from the IRB for changes to the study's protocol and/or consent forms and will not implement the changes until I receive IRB approval for these changes. I will comply with the IRB policy for the conduct of ethical research. I will promptly report significant or adverse effects to the IRB in writing within 5 days of occurrence. I will be responsible for ensuring that the work of others involved with this project complies with this protocol. I will complete, on request by the IRB, the Continuation Request or Completion of Research Activities Forms.

Principal Investigator's Signature

Date

Co-Investigator's Signature

Date

Faculty or EAP Staff Sponsor Assurance (required when a student is the PI)

This is to certify that I have reviewed this research protocol and that I attest to the scientific merit of this study and the competency of the investigator(s) to conduct the project. I assure that the investigator(s) is knowledgeable about the regulations and policies governing research with human subjects. I agree to meet with the investigator on a regular basis to monitor study progress and compliance with IRB policy for the conduct of ethical research.

Faculty or EAP Staff Sponsor's Signature

Date

RESEARCH DESCRIPTION

PROJECT DESCRIPTION

1. DESCRIPTION—The purpose of this research study is to determine the effect of bite charts as positive reinforcement during feeding intervention. A bite chart is constructed from a manila folder divided into four quadrants. Four stickers are attached with Velcro. When the client takes a bite s/he removes a sticker as reinforcement. The client also rates each bite on a scale of 1-5. The scale is represented with smiley faces or numbers depending on the age or cognitive ability of the client. (Please see attached example.)
2. DISSEMINATION—Results will be disseminated at the Communication Disorders and Sciences (CDS) research symposium. Results may be disseminated at Science Fest at Eastern Illinois University, Illinois Speech-Language Hearing Association (ISHA), or other local and state conferences.

METHODOLOGY

3. PARTICIPANTS— Children with feeding disorders will be recruited to participate in this study. They should be between 2;6-8 years of age. According to the *Diagnostic and Statistical Manual of Mental Disorders* ' (DSM-IV-TR), a feeding disorder has four diagnostic criteria: persistent failure to eat adequately (failure to gain weight or significant weight loss within one month); absence of medical condition severe enough to account for the feeding disturbance; the feeding disturbance is not better accounted for by another mental disorder or by lack of available food; and onset of the disorder must be before 6 years of age (Williams, Riegel, & Kerwin, 2009, p. 123-124). The participants also need to be able to attend to a task for at least ten minutes. If the participants have sensory aversions, they should be mild to moderate; however sensory aversions are not a criterion for participation in this study.

Children will be included in this study in order to determine the effectiveness of using a bite chart for behavioral feeding intervention. Children most often display behavioral feeding issues; therefore, they are the prime candidates for this study.

4. RECRUITMENT—Subjects will be recruited from clients at Eastern Illinois University Speech-Language Hearing Clinic and patients of Sarah Bush Lincoln Health Center. A licensed speech-language pathologist will perform the feeding therapy while the researchers observe and collect data. (See attached letter of support).
5. LOCATION OF STUDY—Research will be conducted at Sarah Bush Lincoln Health Center or Eastern Illinois University (EIU) Speech-Language Hearing Clinic (Clinic). Research at EIU Clinic will be done in private therapy rooms.
6. INSTRUMENTS, RESEARCH MATERIALS, RECORDS, & PROCEDURES—

The study will use a BAB design at Sarah Bush Lincoln Health Center and an ABA design at Eastern Illinois University. For the ABA design, researchers will begin by collecting baseline data for approximately 3-4 intervention modules (one intervention module equals 4 trial bites). After baseline data has been collected, researchers will introduce the bite chart. The bite chart will be used until consistent measurements are collected. Once the measurements are collected, the researchers will remove the bite chart, but continue to collect data on bite acceptances. For the BAB design, researchers will begin using the bite chart for approximately 3-4 intervention modules. Then the bite chart will be removed to see a decrease in the data for 3 intervention modules. Once the data is stable, the bite chart will be reinstated to see if the number of bites accepted in the data increase. The administration of the intervention at Sarah Bush Lincoln Health Center will be completed by a licensed SLP. The administration of the intervention at EIU Clinic will be completed by the subject's current therapist, who will be supervised by a licensed SLP. Therapy will be on a continuum starting with touch, moving to smell, then lick, and finally taste. The therapist will place the participant in the appropriate phase before data collection begins. The participant will work toward the next phase throughout the study. Data will be collected for 3-4 weeks and will be obtained specifically for research purposes. The researchers will both collect data during the therapy sessions with a plus/minus system to indicate how many bites were accepted with the bite chart as reinforcement. If the client accepts a bite, a plus will be recorded. Likewise, if the client does not accept a bite, a minus will be recorded.

7. DATA COLLECTION, STORAGE, AND CONFIDENTIALITY—

Data will be collected during the therapy sessions by the researchers without using the real names of the subjects. Only the researchers and supervisors will have access to data collection forms to ensure confidentiality. When the research study has been completed, the data collection forms, consent forms, and other reports will remain with the supervisor for three years. During that time, the reports and data will remain in a locked cabinet. Reports and data forms will be shredded by the supervisor after 3 years.

The therapy sessions at Eastern Illinois University Speech-Language Hearing Clinic will be videotaped to ensure accurate data collection. The clinician, researchers, and supervisor at EIU will have access to the tapes and at the end of the semester the tapes will be deleted. The tapes will be stored by the researchers in a locked cabinet.

8. INFORMED CONSENT—

A consent form will be signed by the parents/legal guardian stating that they give permission for their child to participate in the study. (See attached consent form). Subjects at Eastern Illinois University and Sarah Bush Lincoln Health Center will provide consent in a similar manner using attached documents.

RISKS/BENEFITS

9. **RISKS**—Although participation in this study has minimal risks, food allergies/reactions are a potential risk when food is involved. Risks will be minimized by surveying all clients for food allergies. If families are unsure, the clients will be monitored and if any changes occur, parents and the supervisor will be notified immediately. Subjects will be monitored at both locations for choking and aspiration. Therapists at both locations are trained to address these issues should they arise.
10. **SAFETY PRECAUTIONS**—The subjects will be identified by numbers or pseudonyms to protect confidentiality. Medical history will be taken to make sure no food allergies are present. If food allergies develop, proper steps will be taken to ensure the patients safety. These steps include, parent notification and report to their doctor.
11. **BENEFITS**—The subjects may benefit from an expanded diet. The benefits to society include helping children with feeding disorders increase their variety of food intake.
12. **BENEFITS VS. RISKS**—The benefits of this research study include providing speech-language pathologists (SLPs) with an enhanced method of feeding intervention. This method is non-invasive and may motivate feeding clients to try new foods. Risks include: choking, aspiration, or food allergies/reaction. Benefits include that the individual could expand his/her variety of food intake allowing a more nutritious diet. Risks are considered minimal compared to potential benefits.
13. **INCENTIVES AND RESEARCH RELATED COSTS**— There are no costs or incentives for clients to participate in this study.

QUALIFICATIONS OF INVESTIGATORS

14. Briefly describe the qualifications of the investigators(s) conducting this research project.

Natalie Gray and Melissa Council each earned a Bachelor of Science (BS) degree in Communication Disorders and Sciences in May 2010 from Eastern Illinois University. They both are enrolled at Eastern Illinois University seeking Master's degrees in Communication Disorders and Sciences. Dr. Tina K. Veale has a Ph.D. in Communication Disorders and Sciences and is a licensed SLP.

September 27, 2010

Natalie Gray

Melissa Council

Communication Disorders and Sciences

Thank you for submitting the research protocol titled, "Effectiveness of Bite Charts in Behavioral Feeding Intervention" for review by the Eastern Illinois University Institutional Review Board (IRB). The IRB has Approved this research protocol following an Expedited Review procedure. IRB review has determined that the protocol involves no more than minimal risk to subjects and satisfies all of the criteria for approval of research.

This protocol has been given the IRB number 10-098. You may proceed with this study from 9/22/2010 to 9/21/2011. You must submit Form E, Continuation Request, to the IRB by 8/21/2011 if you wish to continue the project beyond the approval expiration date.

This approval is valid only for the research activities, timeline, and subjects described in the above named protocol. IRB policy requires that any changes to this protocol be reported to, and approved by, the IRB before being implemented. You are also required to inform the IRB immediately of any problems encountered that could adversely affect the health or welfare of the subjects in this study. Please contact me, or the Compliance Coordinator at 581-8576, in the event of an emergency. All correspondence should be sent to:

Institutional Review Board
c/o Office of Research and Sponsored Programs
Telephone: 581-8576
Fax: 217-581-7181
Email: eiuirb@www.eiu.edu

Upon completion of your research project, please submit Form G, Completion of Research Activities, to the IRB, c/o the Office of Research and Sponsored Programs.

Thank you for your assistance, and the best of success with your research.

Robert Chesnut, Chairperson
Institutional Review Board
Telephone: 581-2125
Email: rwchesnut@eiu.edu

Appendix E

Script for Research (cueing)

- A bite acceptance is defined as receipt of food into the clients mouth independently or when fed by an adult, chewed (masticated), and not expelled from the client's mouth.
- A refusal is defined as the client refusing to accept the bite either from a spoon or independent feeding, or expelling the bite from his/her mouth following an acceptance.
- If child refuses to take the bite after the third cue, it is considered a refusal for the purpose of this study.

Treatment phase cueing

- 1st Cue: must be presented as the bite is being presented (i.e. when the granola bar is initially set in front of the client, the cue is given). The initial cue should be your typical first cue (i.e. "It's your turn, take a bite").
- 2nd Cue: should be presented after an initial refusal. It should refer to the bite chart when present (i.e. "remember" pointing to the bite chart).
- 3rd Cue: should be presented after the second refusal. It should refer to the preferred activity on the bite chart (when the bite chart is present).

Withdraw phase cueing

- 1st Cue: must be presented as the bite is being presented (i.e. when the granola bar is initially set in front of the client, the cue is given). The initial cue should be typical first cue (i.e. "It's your turn, take a bite").
- 2nd Cue: should be similar to the first one (general, but not referring to the bite chart) and given after the initial refusal.
- 3rd Cue: should be given after the second refusal and should be a general cue (i.e. "take a bite").
- Cueing three times before it's considered a refusal in our study