There is Emerging Evidence that Behavioral Feeding Therapy for Children Ages 2-5 will Decrease Disruptive Mealtime Behaviors and Increase Food Acceptance

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CLINICAL SCENARIO:

Client population: Children ages two to five with feeding difficulties that are not due to a medical condition or diagnosis.

Treatment Context:

Behavioral based interventions and sensory based interventions are ideally done in a familiar and similar context as to when and where the child normally eats. This could be in a home setting but also in a clinic simulating a home environment. Addison, et al., (2012), feeding interventions were done through a pediatric feeding disorders day treatment program. The sensory based intervention training was done in specific sensory rooms and the behavioral interventions were done in rooms with observation windows. Moor, et al. (2006), conducted treatment in an outpatient setting in a therapy room at the rehabilitation center. Gale, et al., (2010), conducted a home-based early intensive behavior intervention. This involved the treatment being provided in the participant's homes and in the rooms where the child was usually fed.

Purpose:

Children who are diagnosed with a feeding disorder have a variety of different reasons as to why they are having difficulty with feeding. Feeding disorders include any problems that a child may have with gathering food, getting ready to suck, chewing, or swallowing (American Speech-Language-Hearing Association, (2014). Children with feeding disorders differ from children who are considered picky eaters because of the children's extreme selectivity and the child may not eat in situations outside of home due to this selectiveness. Food selectivity is characterized by type, texture, brand, shape, or color. What also characterizes a feeding disorder is when it is restricting their diet and they are not attaining the proper nutrients (Nationwide Children's Hospital, 2014).

The two main themes in the researched articles were children not accepting food and disruptive behaviors at meal time. Moor, et al., (2006) looked specifically at severe food refusal in toddlers with developmental disabilities. Children with food refusal are at a higher risk of malnourishment, stunting in their growth, dehydration and they are more vulnerable to infectious disease (Moor, et al., 2006). Many feeding disorders, such as food refusal, could be organic such as physical abnormalities, neurological dysfunction, or general physical disorders. In many cases however, there are other factors influencing the child's ability to eat. These other factors could be things such as the child associated oral intake with pain and environmental factors that may play a role in the worsening of food refusal. Children may also learn that their behaviors can lead to them not having to eat such as crying or throwing tantrums. It is also evident that the interaction between the feeder and the child may have a large role in not only food refusal but all feeding disorders (Moor, et al., 2006).The study by Gale, et al., (2010) looked at both eating behaviors such as acceptance, refusal, mouth cleans and expulsion, as well as disruptive behaviors which included crying, shouting, pushing food away, self-injury, aggression, attempting to leave and turning head away. This study showed that even if the medical and physiological causes are addressed, the child may still have feeding difficulties (Gale, et al., 2010).

Incidence:
According to Nationwide Children's Hospital (2014), 5%-20% of children who do not have any type of developmental disability are being diagnosed with feeding disorders and 40-80% of children who have a disability have been diagnosed with a feeding disorder. Premature infants, children with failure to thrive (a condition correlated with feeding disorders), children with autism and children with a variety of genetic conditions are those who are more likely to have a feeding disorder (Nationwide Children's Hospital, 2014).

Intervention:
There were several different behavioral techniques that were used in the studies to create behavioral feeding treatment interventions. Even though each of the interventions examined in the articles were slightly different, they all addressed food refusal and disruptive behaviors while eating. The different techniques used were as follows:

- Shaping- Shaping consisted of a stepwise increase in the amount, taste, and texture of the foods that were presented to the children (Moor, et al., 2006).
- Verbal Prompting- A verbal prompt was given at the start of each trial (Moor, et al., 2006). The verbal prompt given before each trial consisted of something like "No swallow the food" and was also given if the child refused to swallow the food (Moor, et al., 2006).
- Positive reinforcement- Positive reinforcement was given when there was oral acceptance of the food presented to the child (Moor, et al., 2006). These positive reinforcements were particular play items and were present in a variable schema which was changed during the course of treatment (Moor, et al., 2006).
- Manipulation of appetite- Prior to the treatment (1-2 hours) no tube feeding was given to the participants in order to increase the child's appetite before starting (Moor, et al., 2006).
- Fading- As the treatment sessions progressed, different techniques were slowly removed and a more normalized eating routine was established (Moor, et al., 2006).
- Escape extinction- Escape extinction was used by not providing an escape from inappropriate behavior during mealtime. Non-removal of the spoon presented to the child during feeding was how this was utilized (Addison, et al., 2012).
- Noncontigent reinforcement- Positive reinforcement of verbal praise was given in a fixed time ratio and was consistent across the treatment session independent from the behaviors that the child exhibited (Addison, et al., 2012).
- Exposure- The foods used in the treatment sessions were kept consistent across treatment intervention (Gale, et al., 2010).

All of these behavioral feeding techniques fall under the International Classification of Function (ICF) level of activity.

*See Table 4

Science Behind Intervention:
Behavioral feeding therapy is an intervention designed to address the behavioral outcomes of the children. B.F. Skinner introduced the concept of the environment shaping the behaviors of humans. A behavior can be strengthened and maintained when the child is positively reinforced and has a pleasing experience. Therefore, a negative behavior can be changed or modified if it is consistently reinforced by a specific, pleasant outcome. This is done by shaping, which is the reinforcement of specific behaviors individually until it generates the desired behavior. Shaping utilizes the technique of grading an activity incrementally in order to reach a desired outcome (Case-Smith, 2006).

OT Framework and Theory Supporting Intervention:

Behavioral feeding therapy is an intervention that addresses the activities of daily living (ADL) of swallowing/eating and feeding which are included in the OT framework. Components of these ADLs are directly impacted by the behavior of a child. If a child refuses to eat and displays inappropriate mealtime behavior, they will not receive the proper nutrition that they need in order to stay healthy and participate in other ADLs. By working on a child's behaviors for feeding and eating, they will eventually be able to work towards becoming independent in these ADLs (AOTA, 2014).

The behavioral feeding interventions directly relates to the Acquisitional Frame of Reference. This frame of reference looks at an individual's behavior as a response to their environment. The environment is constantly reinforcing behaviors and eliciting new skills. The environment will produce positive or negative reinforcements as a response to a behavior which will strengthen and reinforce the behavior or fail to reinforce the behavior. One critical environmental aspect in this intervention is the therapist. The therapist will be setting up the atmosphere and context in which the intervention will take place. The therapist will then be providing praise (positive reinforcement) when the child portrays the desired behavior of accepting the food presented. The child will also be positively reinforced by the satisfaction of no longer being hungry. The feeding intervention uses the Acquisitional Frame of Reference to support and guide the behavioral learning through these interactions with the environment (Kramer & Hinojosa, 2010).

FOCUSED CLINICAL QUESTION:

Do behavioral based feeding therapy interventions increase food acceptance and decrease disruptive mealtime behaviors in children ages two to five whose feeding difficulties are not due to a medical condition compared to sensory-based approaches or to no interventions?

SUMMARY:

- Do behavioral based feeding therapy interventions increase food acceptance and decrease disruptive mealtime behaviors in children ages two to five who feeding difficulties are not due to a medical condition compared to sensory-based approaches or to no interventions?
- Search
    - 7 databases searched
    - 10 relevant articles located
    - The 3 articles critiqued were all high quality case studies with a level 5 score according to the Canadian Levels of Evidence Scale.
    - The seven articles not critiqued due to the fact that they were not behavioral feeding interventions, did match our population, the children had medical conditions that were preventing them from eating, and did not focus on targeted outcomes.
- There is research supporting the use of behavioral feeding interventions in order to increase food acceptance and decrease disruptive mealtime behaviors for children ages 2-5.
- Due to lack of research and study limitations generalization from these studies should be made with caution.

CLINICAL BOTTOM LINE: There is emerging evidence regarding behavioral feeding therapy for children ages 2-5 from these 3 high quality level 5 case studies in order to decrease disruptive mealtime behaviors and increase food acceptance.

Limitation of this CAT: This critically appraised paper has been reviewed by occupational therapy graduate students and the course instructor.

SEARCH STRATEGY:

Table 1: Search Strategy

Databases Searched	Search Terms	Limits used	Inclusion and Exclusion Criteria
A comprehensive search of the UW System Data Bases Health Professions Databases via EBSCOhost CINAHL Plus with Full Text, Cochrane Database of Systematic Reviews, MEDLINE with Full Text, PsycINFO American Journal of Occupational Therapy OT search	Feeding interventions Occupational therapy feeding interventions Feeding therapy Feeding disorders autism Feeding disorders children Mealtime interventions children	2004-2014 Full text available	Children ages 2-5 Feeding disorders not due to physical disabilities Behavioral feeding interventions

RESULTS OF SEARCH

Table 2: Summary of Study Designs of Articles Retrieved

Level	Study Design/ Methodology of Articles Retrieved	Total Number Located	Data Base Source	Citation (Name, Year)
Level 1a	Systematic Reviews or Metanalysis of Randomized Control Trials	4	1. AJOT 2. Murphy library feeding disorders autism 3. Murphy library : EBSCO host – health professions databases – feeding interventions 4. Murphy library : EBSCO host: CINAHL	1. Howe, T.-H., & Wang, T.-N., (2013) 2. Ledford, J.R. & Gast D.L., (2006) 3. Snider, L., Majnemar, A., & Darsaklis, V., (2011) 4. Twachtman-Reilly, J., Amaral, S.C., & Zebrowski, P.P., (2008)
Level 1b	Individualized Randomized Control Trials	1	1. EBSCO host - health professions databases - occupational therapy feeding interventions	1. Gisel, E.G., Tessier, M.J., Lapierre, G., Seidman, E., Drouin, E., & Filion, G., (2003)
Level 2a	Systematic reviews of cohort studies			
Level 2b	Individualized cohort studies and low quality RCT's (PEDro < 6)			
Level 3a	Systematic review of case-control studies			
Level 3b	Case-control studies and non-randomized controlled trials	2	1. AJOT 2. Murphy library: EBSCO host	1. Gibbons, B. G., Williams, K. E., & Riegel, K. E., (2007) 2. Gonzalez, M.L., Taylor, T., Borrero, C.S. W., & Sangkavasi, E., (2013)
Level 4	Case-series and poor quality cohort and case-control studies			
Level 5	Expert Opinion	3	1. Murphy Library – feeding disorders children 2. Murphy Library – feeding disorders children 3. Murphy Library – feeding disorders children	1. de Moor, J., Didden, R., Korzilius, H., (2006) 2. Gale, C.M., Eikeseth, S., Rudrud, E., (2010) 3. Addison, L.R., Piazza, C.C., Patel, M.R., Bachmeyer, M.H., Rivas, K.M., Milnes, S.M., Oddo, J., (2012)

STUDIES INCLUDED

Table 3: Summary of Included Studies

	Study 1: Moor, J., Didden, R., & Korzilius, H.	Study 2: Addison, L. R., Piazza, C. C., Patel, M. R., Bachmeyer, M. H., Rivas, K.M., Milnes, S.M., & Oddo, J.	Study 3: Gale, C., Eikeseth, S., & Rudrud, E.
Design	Non-concurrent multiple baseline case study design across participants	ABCBC Multiple baselines design-control phase follows each test condition phase	Non-concurrent multiple baseline design. Random assignment of baseline sessions.
Level of Evidence	Level 5, High Quality SCED Score: 10/11	Level 5, High Quality SCED Score: 8/11	Level 5, High Quality SCED Score: 7/11
PEDro score (only for RCT)	N/A	N/A	N/A
Population	5 children, ages 2.5-3.3 years old. 3 male subjects and 2 female subjects. All of the children had been on a nasal or gastrostomy tube prior to this study. Each of the children in the study had some type of developmental disorder or syndrome.	Two children admitted to paediatric feeding disorders day-treatment program. Primary presenting problem was a feeding disorder and each had difficulties with sensory processing that contributed to their feeding problems. First child was a 1-year-old boy with food refusal and failure to thrive. This child's data was not used in our CAT due to his age not fitting in the boundaries of our PICO question. The second child was a 3-year-old girl with poor oral intake and food selectivity by type and texture	Three male pre-school aged children (46, 30, and 52 months) diagnosed with an autism spectrum disorder. Severity of diagnosis not specified. All participants were referred to the study by their parents who wanted assistance in improving their child's mealtime behaviors.
Intervention Investigated	Behavioral Feeding Intervention. Intervention consisted of several behavioral feeding techniques, such as appetite manipulation, time out, differential reinforcement, and fading. First technique was shaping and included increase in the amount, taste, and texture of the food	Behavioral Feeding Intervention. Feeding therapist did 5 meals a day with approximately 1-3 hours between the start of each meal. The meals each lasted 30-45 minutes and consisted of 3-7 five-bite sessions. There were 1-2 minute breaks in between sessions. The therapist presented 3 cc of whole milk with instant breakfast mix to child. The therapist also randomly selected four foods to present to child in each	Behavioral Feeding Intervention. Target foods were presented to the child by the parents/tutors during five sessions per day at 10:45 am, 12:00pm, 2:00pm, 3:15pm, and 4:30pm. The child did not eat 30 minutes prior to an intervention session. The child was presented with food on a spoon at 2.5 cm from the child's mouth for 30 seconds. After the 30 seconds the spoon was removed for 2-3 seconds and then re-presented for the next 30-second interval. If and

	presented to the child. At each treatment phase amount of food increased. Secondly, a verbal prompt was given at the start of each trial. Oral acceptance was given verbal positive reinforcement. Reinforcement was given in a fixed ratio and if food was refused then a verbal warning and 5 second non-exclusionary time-out was used. During all trials disruptive behaviors were ignored. No feeding tube was given 1-2 hours before treatment. Reinforcement and verbal prompt were eventually faded out. Treatment was complete when goals for individual child were met ranged from 36-70 sessions. Sessions were held 2-3 times per week for 45-60 minutes and were conducted in an outpatient manner.	session. The order of these foods was presented randomly. Therapist presented the cup or spoon 4 cm from the midline of the child's mouth every 30 seconds using a verbal prompt. Praise was given each time the child accepted the liquid or food. No praise was delivered if the liquid or solid was expulsed after 30 seconds. During the phases of this intervention that included sensory integration, the therapist included the sensory integration protocol for 10 minutes prior to the scheduled meal. The sensory integration protocol included activities involving a vibrating bug, bubbles, and balls.	when the child attempted to push away the spoon or turn their head, the tutor/parent would continue to present the spoon 2.5 cm away for the total of 30 seconds. If the food was accepted in those 30 seconds, the spoon was removed and the child was reinforced for 10 seconds before starting the next trial.
Comparison Intervention	None	Sensory Approach	None
Dependent Variables	1.) Percentage of trials with food acceptance (calculated by dividing the number of trials with food acceptance by the total number of trials) 2.) Frequency of	1.) Acceptance 2.) Inappropriate behavior 3.) Amount child ate or drank	1.) Eating behavior 2.) Disruptive mealtime behavior

	vomiting and/or gagging		
Outcome Measures	1.) Calculation of food acceptance percentage 2.) Number of times child vomited and/or gagged	1.) Measured when any amount of liquid or food passed the child's lips within 5 seconds of presentation 2.) Whenever the child turned their head 45 degrees or more away from cup/spoon, hit the cup/spoon or the feeder's arm/hand, or covered their mouth with presented with food. Converted to a rate by dividing the number of inappropriate behaviors by the amount of time in minutes the cup or spoon was within arm's reach of the child. 3.) Tanita 1475T scale to calculate grams consumed	1.) Acceptance, refusal, mouth clean, and expulsion count 2.) Crying, shouting, pushing food away, self injury, aggression, attempting to leave, and turning head away
Results	Outpatient treatment took between 36-70 sessions and lasted between 4-8 months. After the treatment tube feedings was discontinued with every child. Child "S" treatment lasted 60 sessions, showed no more food refusal, and tube was removed. Child "Sh" treatment lasted 59 sessions, and weight/height increased. Child "T" treatment lasted 68 sessions, vomiting/gagging disappeared, and he orally accepted warm	At baseline, child 1's level of acceptance was low (39%) and mean inappropriate behavior was 11 responses per minute. During the sensory integration phase, level of acceptance was 41% and rates of inappropriate behavior were equal to baseline at 11. Levels of acceptance increased to 94% and rates of inappropriate behavior decreased to 2 after the operant based treatment. At baseline, child 2's level of acceptance was 0% and inappropriate behaviors were high (33). During the sensory integration phase level of acceptance was 0% and inappropriate behaviors were 25. Level of acceptance was	For child 1, treatment continued for 300 sessions and vomiting did not occur after session 71. For the second child, acceptance went from .6 trials to 18.3 trials after intervention. Disruptive behavior went from 19.4 trials at baseline to 3.0 trials after the intervention. The third child had 0 acceptance during baseline and 6.2 trials following the intervention. Disruptive behaviors occurred on all trials during baseline and on 11.8 trials after intervention.

	food. Child "N" treatment lasted 70 sessions, tube removed, and oral acceptance increased to 100%. Child "M" treatment lasted 36 sessions, tube removed, and height increased.	94% and mean inappropriate behaviors were 1 after the operant based treatment.	
Rigor	Reliability checks on food acceptance were conducted in 15% of all sessions. Mean percentage inter-rater agreement was 99.9%. Reliability checks on the treatment procedures done 17% of all sessions and the mean percentage inter-rater agreement was 99.1%. During baseline no treatment principles were in effect and only 25 grams of food was presented.	The second observer in this study simultaneously, but independently collected data on each of the children eating and drinking. Mean agreement calculations were made for each child and the eating and drinking process.	Interobserver agreement was collected for 33% of the total meals. Sessions were videotaped and then scored by the first author or by the three other trained scorers. Interobserver agreement for acceptance or rejection was 99%, for expulsion or mouth clean was 99%, and for presence of disruptive behavior was 97%.
Conclusion	This multicomponent behavioral treatment plan was highly effective in treating severe food refusal in the five toddlers with developmental disabilities. Effects of the treatment were successfully generalized to the home setting with parents.	Operant based treatment techniques can be successful in the treatment of feeding disorders among children. Non-contingent reinforcement was effective when escape extinction was added. Sensory integration intervention was not effective in this study. Authors concluded that some aspects of SI might be helpful for some children and some may increase disruptive mealtime behaviors.	This study demonstrates that functional assessment can be conducted within the child's natural home setting and appropriate treatment can be used by parents and team members in this setting as well. The effects of the implemented intervention are unclear due to multiple factors influencing the outcome of feeding behaviors.

The control column was adapted for the case studies used in this CAT project. In this column, the group discussed the independence of assessors and the observer bias if it was presented in the study.

Table 4:

Study	Behavioral Techniques Used
Moor, et al., 2006	Shaping, verbal prompting, positive reinforcement, manipulation of appetite, fading, and exposure
Addison, et al., 2012	Verbal prompting, positive reinforcement, escape extinction, noncontingent reinforcement, and exposure
Gale, et al., 2010	Positive reinforcement, manipulation of appetite, escape extinction, and exposure

IMPLICATIONS FOR PRACTICE, EDUCATION and FUTURE RESEARCH

PICO Question: Do behavioral based feeding therapy interventions increase food acceptance and decrease disruptive mealtime behaviors in children ages two to five whose feeding difficulties are not due to a medical condition compared to sensory-based approaches or to no interventions?

Terms: Behavioral based feeding therapy interventions include a variety of different behavioral techniques utilized by parents and therapists both during therapy sessions and as a home program to increase food acceptance and decrease disruptive mealtime behaviors.

Overall Conclusions:

Results: Similar Findings:

- All three of the case studies measured the behavioral outcome of the children receiving the behavioral feeding therapy. All three of the case studies demonstrated that behavioral feeding therapy interventions did lead to an increase in food acceptance and a decrease in disruptive mealtime behaviors in the children.
- All three of the case studies used the behavioral techniques of positive reinforcement which included giving the child praise and play time for consuming the food that was presented during treatment. All three of the studies also used the exposure technique which involved keeping the foods that were used in the treatment sessions consistent.

Results: Differences:

- In addition to the behavioral techniques of positive reinforcement and exposure, a variety of other techniques were used in differing combinations. The Moor, et al., (2006) study, used the following techniques: shaping, verbal prompting, manipulation of appetite (the child did not eat prior to treatment), and fading. Addison, et. al., (2012), used verbal prompting, escape extinction (the spoon was consistently held in front of the child), and noncontingent reinforcement (consistent verbal phrase in a fixed time ratio). Gale, et. al., (2010), used manipulation of appetite and escape extinction in combination during the intervention.
- In two of the three studies, treatment was delivered by parents in addition to the therapists concluding that the interventions could be used effectively as a home program if the parents are sufficiently trained by the therapists (Gale, et. al., 2010). Therapists trained the parents and ABA tutors who were responsible for intervention as well as data collection. In Moor, et. al., (2006), there were two steps to implement the intervention into a home program. First, parents were educated on the intervention and instructed on the treatment techniques in the rehabilitation center. The therapists used videotapes of treatment sessions to inform the parents of the techniques. The parents then observed treatment through an observation window and received more information and feedback about the session from the therapist. The

parents then role played the treatment techniques. After, the parent conducted the treatment with their child in the therapy room with the therapist supervising and giving feedback. The second step was the parents were instructed to implement this program at home and feedback was given through home visits and telephone calls.

- In two of the three studies, 5 intervention sessions were completed each day and lasted for approximately 30-45 minutes (Addison, et al., 2012 and Gale, et al., 2010). The third study, completed by Moor, et. al., (2006), utilized interventions 2-3 times per week with each session lasting 45-60 minutes. Total number of weeks was not provided. Of the 45-60 minute intervention session, a maximum of 20 minutes were dedicated to the feeding therapy. Discrepancies related to time in these studies demonstrate that there might not be an optimal treatment schedule.
- Addison, et. al., (2012), used a sensory approach to feeding in conjunction with the behavioral feeding techniques. This was the only study to utilize the sensory interventions.

In these three case studies, the effectiveness of behavioral feeding therapy with children was successful in achieving decreased disruptive mealtime behaviors and increased food acceptance in all three studies despite the differences between the treatment schedules, length of treatment, treatment delivery, intervention protocol, and behavioral techniques used.

Boundaries:

There were a total of 9 children ages 2-5 participating in these three case studies. Diagnoses differed between studies and included children on the autism spectrum (severity not indicated), and developmental disabilities. All children displayed feeding disorders that varied in severity and these feeding difficulties were not due to the child's diagnosis. The three case studies did not indicate exclusion criteria.

Implications for practice:

All three programs utilized a behavioral feeding therapy program. Two of the three looked at behavioral feeding interventions alone whereas one also incorporated a sensory approach which was not found to be as successful. The behavioral feeding techniques that were used were shaping, verbal prompting, positive reinforcement, manipulation of appetite, escape extinction, noncontingent reinforcement, and exposure. Interventions lasted from 30-60 minutes and treatment durations varied across studies. Due to the variation of the treatment duration across studies, post-test information was not provided. In two of the studies, follow-up data was collected 3-12 months after. All sessions were delivered in both out-patient and home settings. Consistent effort by the parent and therapist was required for these interventions to have an effect on behavior.

In summary, the crucial elements in these studies were: positive reinforcement, exposure techniques, and at least 30 minutes of behavioral feeding techniques completed a minimum of 2 times a week.

The studies were level 5 due to all three being individual case studies. This resulted in grade D evidence to support the effectiveness of behavioral feeding therapy to decrease disruptive mealtime behaviors and increase food acceptance.

Clinical Bottom Line:

There is emerging evidence from these three high quality level 5 case studies supporting behavioral feeding therapy for children ages 2-5 to decrease disruptive mealtime behaviors and increase food acceptance.

References:

Reviewed Articles:

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Related Articles:

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Other Resources:

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