

Review Article

Behavioral Intervention for Feeding Disorders

Scattone D*

Department of Pediatrics, University of Mississippi
Medical Center, USA***Corresponding author:** Dorothy Scattone,
Department of Pediatrics at the University of Mississippi
Medical Center, 2500 N. State Street, Jackson, MS 39211,
USA**Received:** December 06, 2016; **Accepted:** February 06,
2017; **Published:** February 09, 2017**Abstract**

Individuals with autism are often poor eaters which may put them at risk for a variety of health problems including, poor bone density, vitamin deficiencies, obesity, and constipation among other medical problems. Behavioral intervention has been well validated in the literature as evidence-based treatment of pediatric feeding disorders and has been increasingly applied to those individuals with autism and other disabilities who are poor eaters. This paper highlights some of the latest behavioral intervention shown effective in increasing food consumption and may serve as a guide for professional and families.

Keywords: Autism; Food selectivity; Pediatric feeding disorders**Introduction**

As many as 90% of children with autism have feeding problems ranging from consuming a small variety of foods (i.e., food selectivity) to rejecting most or all foods (i.e., food refusal) [1,2]. Some families report their child consumed a large variety of foods in toddlerhood and over time consumption of these very same foods diminished significantly. Many of these children eat only starchy foods, specific brands, pureed foods, and/or little to no vegetables [3]. A diet high in snacks and low in vitamins, minerals, and vegetables may lead to long-term health issues including poor bone growth, constipation, and obesity [2].

Behavioral interventions have increasingly been shown effective in the treatment of feeding disorders for some children with autism and other developmental disabilities. These interventions typically involve structured meal schedules, repeated exposure to non preferred foods, reinforcement in the form of verbal praise or tangible items for food acceptance, and ignoring inappropriate mealtime behaviors, for example [4]. Some of these interventions have been implemented by parents [5] while others were more complex and required a trained professional and/or inpatient hospitalization [6]. Following is a summary highlighting some of the previously published case studies on feeding disorders that have been shown effective in increasing food consumption and in some cases food variety.

Simultaneous presentation of non preferred and preferred foods

Presenting both non preferred and preferred foods together may be a simple option for some children with mild food selectivity. For example, Ahearn increased vegetable consumption in an adolescent with autism and mild food selectivity by placing a preferred condiment (i.e., ketchup, BBQ sauce, or mustard) on top a non preferred vegetable (i.e., carrots, broccoli, or corn) [7]. Preferred condiments were determined by a preference assessment and the top three were selected for intervention. Food consumption immediately increased from zero at baseline to 100% during intervention. A choice board was added at the conclusion of the study giving the participant the opportunity to choose a condiment for his vegetables from a selection. The author reported that one year later this participant continued to eat vegetables with condiments and requested them

with an augmentative communication system. The author also noted that neither positive reinforcement in the form of verbal praise nor tangible items were used and may not be necessary when using a simultaneous presentation intervention for some children with mild food selectivity.

In another study, a sequential presentation method requiring the child to eat a small bite of a non preferred food before being given the opportunity to eat a larger bite of a preferred food was compared with a simultaneous presentation method in an effort to increase food consumption for three selective eaters with autism [6]. During the simultaneous presentation condition non preferred food was embedded in a preferred food. For example, broccoli was embedded into an apple slice and salad dressing was placed on top of a non preferred food. For sequential presentations, preferred food was presented within 1 or 2 seconds after each accepted bite of non preferred food.

Simultaneous presentations were immediately effective for two of the participants. Additional modifications were made for the remaining child by having the therapist physically guide his mouth open so that food could be placed directly inside. High rates of expulsions occurred with this procedure making it necessary to add yet another component consisting of re-presenting the expelled bites by scooping them up with a spoon and placing them back into his mouth. Although increased food consumption was gradual for the simultaneous condition with these modifications, no food was consumed at all with the sequential condition for this participant.

The authors suggested that foods consumed by the first two participants were somewhat blended (i.e., salad dressing soaked in food) potentially lessening the aversiveness of their non preferred foods as compared with the last participant whose food which was placed right on top (i.e., a pea placed on a chip) [8]. Perhaps blending preferred food with non preferred food may have lessened the aversiveness leading to a higher volume of consumed foods making physical guidance unnecessary [8].

Fun and games

Making eating game-like may be another alternative for some children with mild food selectivity. Gentry and Luiselli [9] evaluated the effectiveness of a "mystery motivator" for a 4-year old with autism.

Table 1: Behavioral interventions described in the aforementioned studies.

Differential Reinforcement (DR)	Providing verbal praise for accepting a bite while ignoring inappropriate behavior.
Escape Extinction (EE), Nonremoval of the Spoon (NRS)	Ignoring inappropriate mealtime behavior while continuing to hold the spoon in front of the child's mouth.
Modeling	Adult or child models appropriate acceptance and swallowing of food OR models inappropriate mealtime behavior.
Non Contingent Reinforcement (NCR)	Providing reinforcement (e.g., attention) whether or the child accepts food.
Noncontingent Negative Reinforcement	Removing the spoon after a set time limit whether or not the child accepts food.
Physical Guidance	Presenting pressure to the mandibular of jaw to open child's mouth so that food may be deposited.
Positive Reinforcement	Providing verbal praise or tangible items for bite acceptance.
Re-presentation	Scooping up expelled food and redepositing into the mouth.
Sequential Presentation	Presenting a small bite of a nonpreferred food before a slighter larger bite of preferred food.
Simultaneous Presentation	Presenting a nonpreferred and preferred food at the same time.

Sam (fictitious name) was presented with a game spinner consisting of seven numbers and one question mark. He was required to eat the number of bites indicated by the game spinner starting with 1-2 bites and gradually increased over the course of the intervention. If he ate all the bites, he was given verbal praise and access to an activity. If he did not eat all the bites, he was told to leave the table and praise and activities were withheld. If the spinner pointed to the question mark, Sam was given a surprise toy and allowed to eat whatever he wanted. Number of bites increased steadily with the use of the mystery motivator from one to two bites per meal at the beginning of the intervention to five and six bites per meal towards the end (Table 1).

A second intervention was implemented because Sam's mother wanted him to eat all of the foods on his plate without the mystery motivator. She simply, placed the non preferred foods on a plate and instructed him to eat all of it. He was given access to a preferred activity if he ate all foods and did not engage in inappropriate behavior at the table (i.e., loud noises). Sam continued to eat non preferred food during the second intervention without the use of visual cues and without engaging in disruptive behavior. Results were maintained during follow up. The authors noted several limitations including that data were not collected for amount of food consumed or inappropriate meal-time behavior. However, Sam's mother reported high satisfaction with this treatment and developed skills to continue feeding intervention in the context of their own home [9].

Sensory integration

Sensory integration is widely recommended as a treatment for feeding problems and involves engaging the child in a series of activities such as bouncing on a ball, crawling through a tunnel, blowing bubbles, for example, that target the senses [10-13]. These activities are designed to improve the child's sensory "defensive" behaviors such as gagging, refusing, or spitting out foods [11]. This defensiveness is thought to be due to difficulty processing and organizing sensory input [13,14]. Despite little empirical support sensory integration is often widely recommended as a first course of treatment for feeding disorders [2,10,11].

Addison, et al. [15] compared a sensory integration procedure with an established behavioral intervention. Sensory integration consisted of sensory activities held throughout the day and just prior to a meal. Behavioral intervention consisted of two procedures: Escape Extinction (EE) also referred to as Non Removal of the Spoon (NRS) and Non-Contingent Reinforcement (NCR). NRS

involves holding the spoon in front of the child's mouth until a bite is accepted. NCR involves providing attention throughout the meal whether or not a bite is accepted. Results indicated food acceptance was highest during the EE and NCR condition. Sensory integration was not found to increase food consumption or decrease behavior problems. These results should be considered when recommending sensory integration in the treatment of feeding disorders.

Modeling

Although NRS has been shown as an effective treatment, increased behavior problems are often unpleasant side effects. Therefore, Fu, et al. [16] evaluated modeling, Differential Reinforcement (DR), and NRS on the feeding behaviors of two children with autism. An adult modeled appropriate eating while a therapist stated consequences, "Let's try some food. If you finish all of your food, you can pick a treat and play with a toy." During the modeling DR condition, verbal praise was provided for accepting bites. The last condition, combined modeling, DR, and NRS by modeling a verbal warning, "If you don't eat your food, I will have to help you." The model demonstrated inappropriate behavior by engaging in negative vocalizations and pushing the spoon away for up to one minute then opened his mouth and accepted the bite.

Neither participant consumed foods during the modeling only phase; however, one participant ate 2 of 3 foods during modeling DR phase. Overall food consumption was greatest and inappropriate behavior lowest when all three interventions were combined during the modeling, DR, and NRS phase. It should be noted that NRS did not have to be implemented for either participant. The authors suggest that since modeling and DR increased 2 out of 3 foods for one participant perhaps some of the foods targeted were less aversive than others. They also speculate that this participant behavior could possibly be attributed the having the contingency stated aloud. Future research may evaluate characteristics of the model such as age or gender [16].

Using utensils independently

Children begin feeding themselves between 19 and 24 months of age on average [17]. However, some children with feeding disorders are not motivated to feed themselves and rely on a caregiver to feed them. Rivas, et al. examined two procedures designed to increase self-feeding for two young children with complex medical histories and one child with autism who ate only pureed foods.

The first procedure consisted of presenting the food in a bowl in front of the child; however, if the child did not self-feed, the caregiver fed the child two bites of the target food using the NRS procedure described in the previous study. Bites fed by caregiver were increased (up to five) if the child did not self-feed. Results for the first intervention were favorable for two of the participants. Further modifications were made for the third child by feeding him several bites of his least preferred food (the one he avoided most) if he did not feed himself. This additional modification produced the desired effect as the child chose feeding himself over eating his least preferred food. This study demonstrated that manipulating response effort (fewer self-fed bites vs. increased parent fed bites) may increase self-feeding for some children. However, additional manipulations involving food quality (i.e., increasing nonpreferred foods) may be necessary for others to increase motivation for self-feeding [17].

Altering parental consequence

The role of parental consequences on inappropriate mealtime behavior (e.g., shouting, pushing food away) has also been evaluated for three children with autism [9]. Parent responses to their child's mealtime behavior were observed and found to include a variety of consequences including providing toys, juice, praise, placing food in the mouth, removal of privileges, forcing food in the mouth, escape from the meal, and providing preferred foods. All three children were allowed to escape the meal contingent on disruptive mealtime behavior.

Parents were instructed to hold the spoon in front of their child's mouth for 30 seconds and remove it for 2-3 seconds before presenting the next bite. Attempts at pushing the spoon away were blocked. The spoon was removed after the 20th presentation whether or not the child was engaging in problem behavior (non-contingent negative reinforcement). Preferred items/activities were provided for acceptance and swallowing of food.

Increased acceptance of new textures and flavors occurred for two children and increased variety of foods for one of the children. The authors suggest that NRS for food refusal may not be necessary for some children as these participants demonstrated an increase in food acceptance by removing the spoon after 30 seconds and ending the meal after 20 bite presentations. Follow up data for two participants indicated continued progress in eating new foods and using utensils, as well as a continuation of no disruptive mealtime behavior. This finding may be especially important for parents who may find non-contingent negative reinforcement and positive reinforcement more socially acceptable than NRS and may provide them with an alternative treatment modality [9].

Summary and Conclusion

Behavioral feeding interventions may range from least restrictive methods such as reinforcing food acceptance to more restrictive techniques such as physically guiding food into the mouth. However, each intervention is generally tailored to fit the individual needs of the child and begins with the least intrusive method possible. Children who demonstrate mild food selectivity may benefit from interventions such as the mystery motivator. While others who demonstrate more severe food refusal behavior may require NRS in combination with reinforcement or physical guidance. However,

whichever intervention is developed for the child, the intervention will typically involve a shaping procedure whereby number of bites and variety of foods are increased slowly over time [18].

Regardless of method used caregiver training is an important part of the process so that treatment may be generalized from the clinic to home setting. Increasing food variety over time is also an important aspect of treatment and can be targeted with the guidance of a registered dietician who could suggest foods across the major food groups [18]. Future research should continue to target parent implemented procedure with modeling and feedback. Teacher training is also an area for future research as children attend school for six or seven hours per day five days per week and often presented with multiple meals including breakfast, lunch, and/or snacks.

A team of professionals and their families all working together is always preferred to address severe feeding problems in children. Before beginning any feeding intervention program, a medical doctor such as a gastroenterologist should evaluate the child for potential medical problems that may be responsible for the feeding problems. While a team approach may not always be possible, for every child, the work that has been done so far in this area may serve to guide clinicians in their practice as well as the families who are faced with the challenge of getting their child to a healthy varied diet.

References

- Ledford JR, Gast DL. Feeding problems in children with autism spectrum disorders: A review: Focus on Autism. 2006; 21: 153-166.
- Sharp WG, Berry RC, McCracken C, Nuhu NN, Marvel E, Saulnier CA, et al. Feeding problems and nutrient intake in children with autism spectrum disorders: A meta-analysis and comprehensive review of the literature. J of Autism and Devel Disord. 2013; 43: 2159-2173.
- Ahearn WH, Castine T, Nault K, Green G. An assessment of food acceptance in children with autism or pervasive developmental disorder-not otherwise specified. J of Autism and Devel Disord. 2001; 31: 505-511.
- Silverman AH. Behavior management techniques are designed to strengthen adaptive behaviors and weaken maladaptive behaviors. Ann Nutr Metab. 2015; 66: 33-42.
- Gale CM, Eikeseth S, Rudrud E. Functional assessment and behavioural intervention for eating difficulties in children with autism: a study conducted in the natural environment using parents and ABA tutors and therapist. J Autism Devel Disord. 2011; 41: 1383-1396.
- Piazza CC, Patel MR, Santana CM, Goh HL, Delia MD, Lancaster BM. An evaluation of simultaneous and sequential presentation of preferred and nonpreferred food to treat food selectivity. J of Applied Behavior Analysis. 2002; 35: 259-270.
- Ahearn WH. Using simultaneous presentation to increase vegetables consumption in a mildly selective child with autism. J of Applied Behavior Analysis. 2003; 36: 361-365.
- Ahearn WH. Help! My son eats only macaroni and cheese: Dealing with feeding problems in children with autism. Maurice C, Green G, Foxx R. Editors. Making a Difference: Behavioral Intervention for Autism. Austin, TX: Pro-ed Inc. 2003; 51-82.
- Gentry JA, Luiselli JK. Treating a child's selective eating through parent implemented feeding intervention in the home setting. J of Phys Disabilities. 2008; 20: 63-70.
- Walbarger P. Planning an adequate sensory diet-Application of sensory processing theory during the first year of life. Zero to Three. 1984; 7-12.
- Case-Smith, Arbesman M. Evidence-base review of interventions for autism used in or of relevance to occupational therapy. Am J of Occupational Therapy. 2008; 62: 416-429.

12. Schaaf RC, Miller LJ. Occupational therapy using a sensory integrative approach for children with developmental disabilities. *Mental Retardation and Dev Dis Res Reviews*. 2005; 11: 143-148.
13. Kimball JG. Sensory integration frame of reference: Postulates regarding change and application to practice. In P. Kramer & J. Hinojosa (eds.) *Frames of reference for pediatric occupational therapy* (pp169-204). Philadelphia, PA: Lippincott. 1999.
14. Lane SJ. Sensory integration. Accardo, PJ, editor. In: *Neurodevelopmental Disabilities in Childhood*; V ol I. Brookes. 2008; 673-689.
15. Addison LR, Piazza CC, Bachmeyer MH, Rivas KM, Milnes SM, Oddo J, et al. A comparison of sensory integrative and behavioral therapies as treatments for pediatric feeding disorders. *J of Applied Behavior Analysis*. 2012; 45: 455-471.
16. Fu SB, Penrod B, Fernand JK, Whelan CM, Griffith K, Medved S. The effects of modeling contingencies in the treatment of food selectivity in children with autism. *Behavior Modification*. 2015; 39: 771-784.
17. Rivas KM, Piazza CC, Roane HS, Volkert VM, Stewart V, Kadey HJ, et al. Analysis of self-feeding in children with feeding disorders. *J of App Behavior Analysis*. 2014; 47: 710-722.
18. Sharp WG, Jaquess DL, Morton JF, Miles AG. A retrospective chart review of dietary diversity and feeding behavior of children with autism spectrum disorders before and after admission to a day-treatment program. *Focus Autism Other Dev Disabl*. 2011; 26: 37-48.