

Pediatric Feeding Disorders

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Definition

The *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) defines Feeding Disorder of Infancy or Early Childhood as a “persistent failure to eat adequately, as reflected in significant failure to gain weight or significant weight loss over at least 1 month” (APA, 1994, p. 99). The diagnostic criteria also specify that there must be no gastrointestinal or other general medical condition, no lack of available food, no other mental disorder, and onset must occur before age 6 years. Although these diagnostic criteria may be useful for differentiating between organismic and behavioral etiologies of pediatric feeding disorders, there are problems with the definition. Clinicians most often find the feeding problems of infants and children a function of both behavioral and medical factors (Budd et al., 1992; Palmer, Thompson, & Linscheid, 1975). In addition, although feeding disorders can occur in the absence of medical problems, few children with gastrointestinal and/or other medical conditions associated with feeding disturbances are without aversive learning histories that create behavioral problems (Budd et al., 1992; Jenkins & Milla, 1988). Therefore, most clinicians define a pediatric feeding disorder as a child’s inability or refusal to eat or drink sufficient quantities to maintain nutritional status, regardless of etiology (Babbitt, Hoch, & Coe, 1994; Budd et al., 1992).

Symptoms, Signs, and Diagnosis

A feeding disorder is typically identified when, despite persistent attempts by parents or caregivers, a child’s behavior results in failure to eat sufficient quantity or types of foods to sustain weight, meet nutritional needs, and/or grow. Pediatricians are usually the first to identify the disorder, and numerous medical tests may be conducted to identify potential organic etiologies. Organic factors include structural, gastrointestinal, or metabolic abnormalities, mechanical obstructions, cranial nerve damage, food allergies, and dysphagia (Iwata, Riordan, Wohl, & Finney, 1982; Palmer & Horn, 1978). Environmental factors include insufficient exposure to developmentally appropriate textured or types of food or behavioral mismanagement. Feeding disorders, however, most often arise from combined behavioral and medical etiologies, which complicate diagnosis, assessment, and treatment (Horner & Ludwig, 1981). In fact, diagnostic confusion has prevailed in the literature. Early attempts at differential diagnoses such as dichotomous classifications of nonorganic versus organic failure to thrive (Pollitt, Eichler, & Chan, 1975) have failed to capture the full range of potential contributing variables (Kerwin & Berkowitz, 1996). Although more comprehensive classification systems that include children who do not meet clinical cutoffs for failure to thrive (e.g., height for weight below the fifth percentile) have been proposed, the clinical value of

such classifications has not yet been evaluated (Budd et al., 1992). Regardless of etiology, however, feeding disorders can have serious deleterious effects on a child's growth and development.

Consequences and Complications

Insufficient food intake can result in weight loss, malnutrition, lethargy, impaired mental or physical development, and even death (Christophersen & Hall, 1978; Riordan, Iwata, Wohl, & Finney, 1980). In addition to these direct results of a feeding disorder, disruption of normal parent-child mealtime interactions such as cuddling and other forms of positive social interactions often occur (Budd et al., 1992). In many cases, extreme food refusal that produces malnutrition and dehydration necessitates medical interventions such as enteral feeding by nasogastric or gastrostomy tubes. Unfortunately, although tube feedings produce positive short-term effects (i.e., weight gain and improved nutritional status), medical management alone does not resolve the behavioral problem of food refusal. In addition, prolonged enteral feedings have been shown to disrupt the development of normal oral feeding (Babbitt et al., 1994). In fact, most of the children who have experienced long-term enteral feedings develop increased avoidant behavior and display greater difficulty in establishing oral food consumption (Vogel, 1986).

Prevalence and Incidence

Prevalence statistics have ranged widely in the literature. Inadequate intake has been reported to cause 20% of all childhood dietary insufficiencies and to occur in 33% of persons with developmental disabilities in residential placements (Palmer & Horn, 1978). Prevalence is reported to be somewhat higher for children with developmental disabilities. For example, Jones (1982) reported a range in occurrence from 19% to 61%, and Perske, Clifton, McClean, and Stein (1977) reported estimates as high as 80% for behavioral feeding problems in persons with developmental disabilities.

Etiology, Maintaining Factors, and Functional Analysis

Children with feeding disorders can be differentiated into classifications of their problem's etiology. Palmer, Thompson, and Linscheid (1975) attributed 79% of feeding problems to neuromotor dysfunction and 21% to behavioral mismanagement. In another study, 50 children with feeding disorders were categorized according to etiology as 26% organic in nature, 40% primarily organic, 24% primarily nonorganic, and 10% nonorganic (Budd et al., 1992). Therefore, the primary etiology of many pediatric feeding disorders can be attributed to organismic variables such as structural abnormalities, metabolic syndromes, neurological deficits, or other chronic systemic illnesses. In such cases, the first intervention is to medically resolve or attenuate the adverse effects of the disorder. For example, gastroesophageal reflux (GER) is relatively common in infants, but generally resolves with age and experience (Hyman, 1994). However, untreated or persistent GER can result in painful swallowing or chronic heartburn. Thus, the child

may develop a conditioned aversion to food because eating is associated with chronic pain. Medical treatment for GER usually involves thickened feedings, medication to improve gastrointestinal motility or to decrease acid secretion, or surgery (Hyman, 1994). Once the GER is alleviated or attenuated, however, behavioral treatment is necessary to overcome the child's conditioned aversion to the feeding situation. For other children, feeding disorders may develop as a result of physiological deficits such as oral motor dysfunction or craniofacial abnormalities and therefore be a function of combined skill-based, motivational, and physiological deficits. In such cases, combined medical and behavioral assessments may be necessary to identify maintaining variables (Iwata et al., 1982). Finally, although medical interventions may alleviate the aversive symptoms that initially affect a child's eating behavior, most feeding disorders resulting from organismic variables will persist because of the associated learning history and thus require behavioral treatment.

A number of environmental variables can be involved in the development and maintenance of behaviors associated with feeding disorders. First, the inappropriate behaviors (e.g., batting away the spoon, turning the head away, crying) may be maintained by positive reinforcement such as parental attention through coaxing or bribing at mealtime (Palmer et al., 1975). Second, the behaviors may be maintained by negative reinforcement such as meal termination (Babbitt et al., 1994). Third, failure to introduce solids at the appropriate age may result in a failure to develop age appropriate eating skills (Luiselli & Gleason, 1987). Finally, in addition to the conditioned aversion to food that can result from pairing eating with a painful medical condition, forced feedings can result in an aversion to meals and function to evoke inappropriate behavior in future meals (Iwata et al., 1982). Therefore, a scenario can develop in which a combination of variables maintain and strengthen the food refusal behaviors. For example, a parent may begin force feeding a relatively normal child who occasionally refuses food thereby establishing mealtime as an aversive event to be avoided. The parent may then positively reinforce the avoidant behaviors by offering preferred toys or activities in an attempt to coax the child to eat. Therefore, most feeding disorders involve multiple maintaining variables and identification of parental behavior and environmental factors that have maintained and/or strengthened the child's behavior is an important part of treatment development.

Munk and Repp (1994) recently reported a behavioral assessment designed to identify antecedent variables related to food refusal and food selectivity. By manipulating the types and textures of food presented and maintaining consistent consequences, they determined that each child's behavior fit into one of four categories of feeding disorders (food refusal, type selectivity, texture selectivity, and type and texture selectivity). However, although a behavioral assessment would be useful for identifying the particular topography of a feeding disorder, the larger task of identifying the maintaining variables for feeding problems has yet to be reported. Functional analysis of pediatric feeding disorders has received little attention in the literature. Nevertheless, the most important first step in assessing the function of a child's feeding problem is a complete medical evaluation to identify or rule out physiological determinants. In

addition to identifying conditions in need of medical intervention, the results of medical evaluation can provide valuable clues as to the origin and possible maintaining variables for the feeding disorder. For example, the presence of GER would suggest that food refusal behavior was acquired and maintained, at least in part, by negative reinforcement. Further research is needed, however, to develop effective methods for identifying behavioral determinants for these disorders.

Treatment

The treatment of feeding disorders represents a relatively new area of application for behavior analysis. Early research reporting effective treatment focused on reinforcement-based interventions such as delivery of social attention and preferred foods contingent on consumption of non preferred food (Bernal, 1972; Palmer et al., 1975; Riordan et al., 1980). Although all reported treatments have included positive reinforcement components, most interventions have shown that negative reinforcement (e.g., escape or avoidance of the feeding situation) appears to be a maintaining variable requiring the use of escape extinction (Ahearn, Kerwin, Eicher, Shantz, & Swearingin, 1996; Hoch, Babbitt, Coe, Krell, & Hackbert, 1994; Riordan et al., 1980). Therefore, most reported treatments for feeding disorders have consisted of multiple treatment components. In addition to variations in treatment components, interventions also have varied depending on the particular type of feeding disorder.

Behavioral treatments for total food refusal have been reported in the literature. Typically treatment consists of reinforcement contingent on accepting bites of food and extinction for behavior incompatible with food acceptance (Cooper et al., 1995; Hoch et al., 1994; Iwata et al., 1982). A variety of methods have been used as escape extinction to decrease food refusal behaviors. Physical prompting by exerting gentle pressure on the child's chin so that the mouth is guided open and placing the food in the child's mouth has been demonstrated to be effective (Iwata et al., 1982). Other researchers, however, have questioned the medical safety (i.e., physical prompting may cause aspiration pneumonia, although this has not been empirically evaluated) and parental satisfaction for the use of physical prompting (Hoch et al., 1994). Another escape extinction procedure reported to be effective involves positioning the spoon in front of the child's mouth (nonremoval of the spoon) until the bite is accepted (Hoch et al., 1994). In a recent study, a comparison of the two procedures (physical prompting versus nonremoval of the spoon) in an alternating treatments design was conducted (Ahearn et al., 1996). Results showed both treatments effective in establishing the food acceptance of three children. Physical prompting, however, resulted in fewer collateral behaviors (e.g., negative vocalizations, disruption and self-injury), greater parental preference, and shorter meal durations. Future research should be conducted to assess the relative treatment acceptability and factors affecting the treatment efficacy of the two procedures.

Although escape extinction and reinforcement for food acceptance effectively produce high rates of accepted bites, the child may spit out the accepted food. Therefore, a second escape extinction procedure may be used to decrease expelling. This component

consists of re-presenting the expelled bite (e.g., scooping the food off the child's chin and placing the food into the child's mouth) until it is swallowed and delivering reinforcement contingent on swallowing (Ahearn et al., 1996; Cooper et al., 1995). A number of studies have demonstrated that a multiple component treatment package including escape extinction for food refusal, escape extinction for expelling food, and reinforcement contingent on food acceptance and food swallowing is effective in establishing food consumption (Ahearn et al. 1996; Cooper et al. 1995; Hoch et al., 1994; Iwata et al., 1982; Kerwin, Ahearn, Eicher, & Burd, 1995; Riordan et al., 1980). In another recent study, the relative contributions of treatment components were assessed (Cooper et al., 1995). The interventions consisted of escape extinction for behavior incompatible with food acceptance (nonremoval of the spoon), positive reinforcement (contingent attention) for accepting bites and swallowing, and noncontingent play (toys continuously available during meals). Results showed that for four children with food refusal, escape extinction was a necessary variable for all four children, and positive reinforcement and noncontingent play (e.g., toys continuously available during meals) were necessary for two children. Further research should continue to examine when, or if, different treatment variables are necessary for treatment success.

Food selectivity by type or texture is another frequently encountered problem, particularly among children with developmentally disabilities (Riordan et al., 1980). Riordan et al. (1980) showed that, in addition to the aforementioned multiple component treatments, systematically increasing the number of bites of non preferred food accepted and swallowed contingent on the delivery of preferred foods was effective in decreasing the food selectivity of two children with multiple handicaps. This was accomplished by delivering a bite of preferred food contingent on a bite of first one, then two, and then three bites of non preferred food until all food groups were trained. In another study, sensory reinforcement and texture fading were effective in increasing food consumption to age appropriate volume and texture for a 4-year-old boy with hearing and visual impairments (Luiselli & Gleason, 1987). The procedure consisted of presenting light and rocking motion contingent on consuming bites of food and gradually increasing the food texture across meals. Both studies demonstrate the efficacy of stimulus fading as treatment for food selectivity by children with developmental disabilities. Further research should examine the utility of stimulus fading for increasing treatment efficacy.

Other types of feeding disorders that have been successfully treated with behavioral interventions include adipsia (Friedin, Borakove, & Fox, 1982), dysphagia (Lamm & Greer, 1988), and vomiting (Dahlquist, 1990). By using edible reinforcement and systematically increasing the amount of liquid presented from a set of measuring utensils from 1/4 teaspoon to a cup, a 14-year-old boy with multiple handicaps was successfully treated for total fluid refusal (Friedin et al.). Dysphagia, an inability or difficulty in swallowing, was successfully treated by using a least-to-most prompting sequence and social reinforcement for swallowing bites of food (Lamm & Greer, 1988). The least-to-most prompting consisted of independent, verbal, verbal plus partial physical, and verbal prompting plus swallow elicitation (e.g., touching the right posterior part of the tongue to elicit the swallow reflex). Results showed that all three children in

the study acquired swallowing skills. In another study, persistent vomiting was successfully treated using competing behaviors (solving arithmetic problems and playing video games post-meals), reinforcement for increasing latencies to vomit, response cost (restricted phone use and visitor privileges), a point system, and systematic increases in volume of food and liquid (Dahlquist, 1990). Results showed the vomiting of a 13-year-old boy was totally eliminated after 12 days of treatment. All three of these studies represent new and innovative behavioral treatments for severe feeding disorders. Further research is needed to explore effective treatment options for these behavior problems.

For some children, especially those with developmental disabilities, physical abnormalities, or neurodevelopmental syndromes, learning to self-feed can be problematic. In one recent study, five patients with Rett syndrome, a neurodevelopmental disorder in females that results in a gradual deterioration of hand-use, were successfully taught to scoop and place food in their mouths (Piazza, Anderson, & Fisher, 1993). The procedure consisted of three-step guided compliance (least-to-most prompting), and social reinforcement contingent on completing a component of self-feeding (e.g., placing the spoon in the mouth) following a verbal or gestural prompt. Another study showed that 14 boys with profound developmental disabilities were successfully taught to self-feed by fading out the amount of physical assistance (most-to-least prompting) to scoop and place the food in their mouths (Berkowitz, Sherry, & Davis, 1971). Both studies demonstrate the efficacy of prompting procedures and reinforcement for teaching self-feeding skills. Further research is needed to determine the relative efficacy of different prompting procedures for teaching these type of skills.

Finally, parent training is an important determinant for the generalization and maintenance of treatment gains achieved during behavioral interventions. Most studies report that parents were taught to implement the interventions, however, fewer report how that training was actually conducted (Werle, Murphy, Tria, & Budd, 1993). One recent study examined the effects of a behavioral parent training program on the parent's acquisition of feeding skills and the child's feeding behavior within the context of the child's natural eating environment (Werle et al.). Three children with food selectivity and their mothers participated in training in their own homes. The mothers were taught to provide regular presentations of the non preferred foods, provide contingent attention for appropriate behavior, provide specific prompts during meals, and to use time out for disruptive behavior. Parent training consisted of educational information, instruction, discussion, handouts, role playing, behavioral rehearsal, verbal feedback, and videotape reviews. Results showed all three mothers acquired the intervention skills and all three children increased their acceptance and consumption of the target foods. Other researchers have described the use of similar training methods to teach parents to implement feeding treatments (Babbitt et al., 1994; Iwata et al., 1982). Further research is needed to determine the efficacy of various parent training methods, the relative contribution of training components, and to develop methods for ensuring long-term maintenance of treatment gains.

Prognosis

A review of the literature shows that prognosis for children receiving behavioral treatment for feeding disorders appears favorable. Of the reviewed treatment studies reporting follow up data, continued improvement or maintenance of treatment gains was shown for up to 41 months post treatment (Berkowitz et al., 1971; Dahlquist, 1990; Friedin et al., 1982; Handen, Mandell, & Russo 1986; Lamm & Greer 1988; Palmer, Thompson, & Linscheid, 1975; Riordan et al., 1980). For example, in the study on the behavioral treatment of a boy's life threatening adipsia, Friedin et al. (1982) showed stimulus generalization to other fluids and continued treatment gains at 1-year follow up. In another study examining behavioral treatment for food refusal, Handen et al. (1986) showed improvements for all seven children at varying lengths of time for follow up from 6 months to 28 months post treatment. Similarly, another study reporting treatment for food refusal showed all four children continued improvement post treatment, with self-feeding and chewing skills developing during the 2-year follow up period (Riordan et al., 1984). In a study reporting the behavioral treatment of dysphagia, all three infants continued improvements at 15, 21, or 24 months follow up, with two of the children discontinuing gastrostomy tube feedings, and the third child on substantially reduced tube feedings (Lamm & Greer, 1988). Finally, self-feeding skills were maintained for 41 months post treatment for 10 of the 14 boys trained to self-feed (Berkowitz et al., 1971), and two of the three children with Rett syndrome taught to self-feed 1 1/2 and 2 years post treatment (Piazza et al., 1993). These and other results suggest that behavioral treatments can result in long-term behavioral gains.

Maintenance and generalization appear to be strongly correlated with parental compliance. For example, Cooper et al. (1995) showed variable maintenance and improvements at follow up, with one child's behavior returning to baseline levels when the parents discontinued the treatment protocol. Other studies report parental noncompliance for participation in follow up visits by some of their subjects (e.g., Piazza et al., 1993). Treatment success and continued gains in the home are largely determined by parental compliance in implementing the treatment procedures and following the clinician's recommendations. Although researchers have begun the task of identifying and demonstrating effective treatments for feeding disorders, the much larger task of maintenance and generalization of treatment gains is yet to be explored. Further research is needed to develop effective methods for fading out treatment components and facilitating the child's transition from structured behavioral feeding procedures to independent participation in the family meal; the true test of treatment success.

References

- Ahearn, W. H., Kerwin, M. E., Eicher, P. S., Shantz, J., & Swearingin, W. (1996). An alternating treatments comparison of two intensive interventions for food refusal. *Journal of Applied Behavior Analysis*, 29, 321-332.

American Psychiatric Association. (1992). Diagnostic and statistical manual of mental disorders (4th ed., rev.). Washington, DC: Author.

Babbitt, R. L., Hoch, T. A., & Coe, D. A. (1994). Behavioral feeding disorders. In Tuchman, D. N. & Walther, R. S. (Eds.), Disorders of Feeding and Swallowing in Infants and Children: Pathophysiology, Diagnosis, and Treatment. Singular Publishing Group, Inc.: San Diego.

Berkowitz, S., Sherry, P. J., & Davis, B. A. (1971). Teaching self-feeding skills to profound retardates using reinforcement and fading procedures. Behavior Therapy, 2, 62-67.

Bernal, M. E. (1972). Behavioral treatment of a child's eating problem. Journal of Behavior Therapy and Experimental Psychiatry, 3, 43-50.

Budd, K. S., McGraw, T. E., Farbisz, R., Murphy, T. B., Hawkins, D., Heilman, N., & Werle, M. (1992). Psychosocial concomitants of children's feeding disorders. Journal of Pediatric Psychology, 17, 81-94.

Christophersen, E. R., & Hall, C. L. (1978). Eating patterns and associated problems encountered in normal children. Issues in Comprehensive Pediatric Nursing, 3, 1-16.

Cooper, L. J., Wacker, D. P., McComas, J. J., Brown, K., Peck, S. M., Richman, D., Drew, J., Frischmeyer, P., & Millard, T. (1995). Use of component analyses to identify active variables in treatment packages for children with feeding disorders. Journal of Applied Behavior Analysis, 28, 139-153.

Dahlquist, L. M. (1990). The treatment of persistent vomiting through shaping and contingency management. Journal of Behavior Therapy and Experimental Psychiatry, 21, 77-80.

Friedin, B. D., Borakove, L. S., & Fox, K. T. (1982). Treatment of abnormal avoidance of fluid consumption. Journal of Behavior Therapy and Experimental Psychiatry, 13, 85-87.

Handen, B. J., Mandell, F., & Russo, D. C. (1986). Feeding induction in children who refuse to eat. American Journal of Diseases of Children, 140, 52-54.

Hoch, T. A., Babbitt, R. L., Coe, D. A., Krell, D. M., & Hackbert, L. (1994). Contingency contacting: Combining positive reinforcement and escape extinction procedures to treat persistent food refusal. Behavior Modification, 18, 106-128.

Horner, C., & Ludwig, S. (1981). Categorization of etiology of failure to thrive. American Journal of Diseases of Children, 135, 848-851.

Hyman, P. E. (1994). Gastroesophageal reflux: One reason why baby won't eat. The Journal of Pediatrics, *125*, 285-297.

Iwata, B. A., Riordan, M. M., Wohl, M. K., & Finney, J. W. (1982). Pediatric feeding disorders: Behavioral analysis and treatment. In P. J. Accardo (Ed.), Failure to thrive in infancy and early childhood: A multidisciplinary team approach (pp. 265-295). Baltimore: University Park Press.

Jenkins, J., & Milla, P. (1988). Feeding problems and failure to thrive. In N. Richman & R. Lansdown (Eds.), Problems of Preschool Children. John Wiley & Sons, Ltd.: New York.

Jones, T. W. (1982). Treatment of behavior-related eating problems in retarded students: A review of the literature. In J. H. Hollis & C. E. Meyers (Eds.), Life threatening behavior: Analysis and intervention (pp. 3-26). Washington, DC: American Association on Mental Deficiency.

Kerwin, M. E., Ahearn, W. H., Eicher, P. S., & Burd, D. M. (1995). The costs of eating: A behavioral economic analysis of food refusal. Journal of Applied Behavior Analysis, *28*, 245-260.

Kerwin, M. E., & Berkowitz, R. I. (1996). Feeding and eating disorders: Ingestive problems of infancy, childhood, and adolescence. School Psychology Review, *25*, 316-328.

Lamm, N., & Greer, D. (1988). Induction and maintenance of swallowing responses in infants with dysphagia. Journal of Applied Behavior Analysis, *21*, 143-156.

Luiselli, J. K., & Gleason, D. J. (1987). Combining sensory reinforcement and texture fading procedures to overcome chronic food refusal. Journal of Behavior Therapy and Experimental Psychiatry, *18*, 149-155.

Munk, D. D., & Repp, A. C. (1994). Behavioral assessment of feeding problems of individuals with severe disabilities. Journal of Applied Behavior Analysis, *27*, 241-250.

Palmer, S., & Horn, S. (1978). Feeding problems in children. In S. Palmer & S. Ekvell (Eds.), Pediatric nutrition in developmental disorders (pp. 107-129). Springfield, IL: Charles C. Thomas.

Palmer, S., Thompson, R. J., & Linscheid, T. R. (1975). Applied behavior analysis in the treatment of childhood feeding problems. Developmental Medicine and Child Neurology, *17*, 333-339.

Perske, R., Clifton, A., McClean, B. M., & Stein, J. I. (Eds.) (1977). Mealtimes for severely and profoundly handicapped persons: New concepts and attitudes. Baltimore: University Park Press.

Piazza, C. C., Anderson, C., & Fisher, W. (1993). Teaching self-feeding skills to patients with Rett Syndrome. Developmental Medicine and Child Neurology, 35, 991-996.

Pollitt, E., Eichler, A. W., & Chan, C. K. (1975). Psychosocial development and behavior of mothers of failure-to-thrive children. American Journal of Orthopsychiatry, 45, 525-537.

Riordan, M. M., Iwata, B. A., Wohl, M. K., & Finney, J. W. (1980). Behavioral treatment of food refusal and selectivity in developmentally disabled children. Applied Research in Mental Retardation, 1, 95-112.

Werle, M. A., Murphy, T. B., & Budd, K. S. (1993). Treating chronic food refusal in young children: Home-based parent training. Journal of Applied Behavior Analysis, 26, 421-433.

Vogel, S. (1986). Oral motor and feeding problems in the tube fed infant: Suggested treatment strategies for the occupational therapist. In F. S. Cromwell (Ed.), Occupational therapy for people with eating dysfunctions. New York: Hayworth Press.