

Critical Review:
**The Effectiveness of Behavioural Treatment Approaches to Improve Oral Intake in Children
with Feeding Challenges or Food Refusal**

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This critical review examines the effectiveness of behavioural treatment approaches to improve oral intake in children with feeding challenges or food refusal. All studies reviewed utilized single-subject research design. Overall, research supports the use of various behavioural interventions in establishing oral food intake in children with food refusal in the absence of organic causes. However, it has been suggested that future researchers should attempt to evaluate additional forms of behavioural treatment that may prove to be effective, but for which empirical evidence is still lacking.

Introduction

Children who suffer from food refusal are generally described as exhibiting a pattern of freely accepting a limited range of food, only soft textures, or an inadequate amount of food to maintain a healthy weight (Ginsberg, 1998 and Williamson et al., 1987, as cited in Werle, Murphy, & Budd, 1993). Food refusal is often associated with disruptive behaviours such as refusing to self-feed, gagging on or spitting out food, and eating on a varying schedule (Linscheid, 1992).

Children with severe food refusal are at high risk for a number of problems including excessive weight loss, lethargy, dehydration, malnutrition, vulnerability to infectious diseases, and growth retardation (Riordan et al., 1984; de Moor et al., 2006).

There is rarely a single cause in situations of food refusal. The etiology of food refusal can be attributed to a number of organic factors including physiological abnormalities, such as anatomical defect, neurological dysfunction, or acute infectious diseases (Werle et al., 1993; Byars et al., 2003; Riordan et al., 1984). However, abnormal feeding patterns are not solely a result of organic impairment. Though congenital disorders are responsible for the onset of the majority of feeding challenges, these problems are often sustained by behavioural factors such as the environment (Riordan et al.; Byars et al.).

Research has demonstrated that feeding problems in children can be treated effectively using behavioural approaches to treatment (Babbitt et al., 1994 as cited in Linscheid, 2006; Kerwin, 1999). Training parents in appropriate behavioral treatment procedures can encourage the transference of skills from the hospital to the home setting and it may help with issues that are not

present in a controlled medical/clinical setting (Werle et al., 1993; Gutentag et al., 2000).

Although speech-language pathologists may not work directly in cases where children have feeding challenges, they may work in collaboration with other professionals in the assessment and treatment via referrals (Linscheid, 2006). Therefore, it is of benefit for S-LPs to familiarize themselves with the various behavioural interventions used and to address food refusal and the empirical evidence that support these approaches.

Objectives

The primary objective of this paper is to critically evaluate existing literature regarding the effectiveness of behavioural treatment in improving oral intake in children with food refusal or food challenges. Recommendations on how to incorporate evidence-based behavioural methods into clinical practice, as well as suggestions for future research will be discussed.

Methods

Search Strategy

Computerized databases, including MEDLINE and PubMed were searched using the following search strategy:

(infant OR child) AND (food aversion OR food refusal OR oral aversion) AND feeding AND (treatment or therapy).

Reference lists from articles were also used to obtain relevant studies.

Selection Criteria

Studies selected for inclusion in this critical review paper were required to investigate the effectiveness of behavioural interventions to establish oral food intake in

children with food refusal. Articles used a variety of behavioural approaches, including appetite manipulation, and contingency management techniques (i.e., positive and negative reinforcement). No limits were set on the demographics of research participants or outcome measures.

Data Collection

Results of the literature search yielded 4 single-subject research studies and 1 group design compatible with the aforementioned selection criteria.

Results

De Moor, Didden, and Korzilius (2006) assessed the effects of a behavioural treatment package on five toddlers with severe food refusal and developmental disabilities using a single-subject design with nonconcurrent multiple baselines. All children had different syndromes/diseases. At the time of referral, three children were fed via gastrostomy tube and two children were fed via nasal tube. The behavioural treatment package included differential positive reinforcement, shaping, and escape/avoidance extinction. Treatment was completed in an outpatient setting and parents acted as co-therapists in the home setting. Data was obtained on two dependent variables: 1) percentage of trials with food acceptance; and 2) frequency of vomiting and/or gagging. Reliability checks were performed in 15% of all sessions, equally divided across phases of treatment and children. Data collection occurred immediately before and after any new treatment was administered.

Results revealed that a multicomponent behavioural treatment package was effective in eliminating severe food refusal in five toddlers with developmental disabilities. Following the treatment, tube feeding was discontinued for all the children due to their dietary needs being met by oral intake. Health status of each child improved and follow-up indicated that the effects of treatment were maintained.

Methodological/procedural critique - The study conducted by De Moor, Didden, and Korzilius (2006) revealed the effectiveness of a multicomponent behavioural treatment plan in children with severe food refusal. However, the paper did not discuss any specific limitations in its study even though some were noted, including the lack of measuring tools used when calculating the percentage of food that was accepted. Various amounts (e.g., 25g, 50g, 75g, and 100g) were presented to the children and the criterion was a mean acceptance of 80% during four consecutive trials. It seems unclear as to how that 80% was determined by the experimenter other than by subjective means. Additionally, the treatment package that was carried out

consisted of several methods, including appetite manipulation, time out, differential reinforcement and fading. However, data was not collected with regards to how each method contributed to the treatment effect. It would have been beneficial for establishing comprehensive treatment outcomes if observations had been made regarding the methods' effects. One cannot conclude whether one method worked better than the others or a combination of methods had been successful.

The authors employed the use of visual analysis to present the data. Based on descriptive data (i.e. increased weight) and parental reporting, it was assumed that oral intake had improved and food refusal was extinguished. It should be noted that this study obtained a high inter-rater agreement (99.9%) on the reliability checks on the percentage of food acceptance. This is indicative of a strong measurement tool. However, they did not interpret the data so readers could not say for certain that the treatment improved oral intake. The evidence of this study may have been stronger with the use of statistically significant tests such as a celeration line or a 3SD Band Approach.

Level of Evidence – This study was a single subject design, using a baseline, which generally gives it a moderately high level of evidence; however, the lack of statistical analysis puts into question the strength of data provided. Weight and height changes were also attributed to the treatment.

Riordan, Iwata, Finney, Wohl, and Stanley (1984) examined the eating behaviour of four handicapped children with a history of food refusal and who were nutritionally “at risk”. The inclusion criteria were based on: a) reports of physical risk due to a feeding problem, b) no structural or other organic difficulties precluding oral food intake, and c) mealtime observations suggesting a behavioural component to the child’s oral intake problem. Baseline data was taken during mealtimes and showed that all children accepted very little food, expelled food frequently, and engaged in a number of disruptive behaviours. Treatments involved one or more of the following contingent events: social praise, access to preferred foods, brief periods of toy play, and forced feeding.

Results of multiple-baseline and reversal designs showed significant behavioral improvement for each child and increases in the amount of food consumed. Further improvements were observed at follow-up, which varied from 7 to 30 months posttreatment.

Methodological/procedural critique - Riordan et al. (1984) also achieved positive outcomes in their study of children with chronic food refusal. The findings of their study indicated that the children accepted and ate

significantly more food post-treatment compared to their baseline data. Unlike the study conducted by De Moor et al. (2006), variations were noted for each child when evaluating the effects of treatment. For example, consequences that were dependent only on food acceptance were effective in reducing two of the four children's food expulsion, however, the results for another child was inconsistent. Not only were food selections different from each child, treatment also varied for some of the children and this was documented and discussed.

Data was presented using graphs and mean percentages. Baseline, acceptance, expulsion, disruption, and number of grams consumed were conditions that were recorded and explicitly defined as dependent measures. Interobserver agreement ranged from 80%-99% for these measures. Reliability measures were also obtained on the amounts of food accepted and mean percentages of agreement ranged from 99.2%-99.9%. This demonstrates a high reliability and therefore strong data. The assessment procedures used were modeled from a number of single-case reports and the authors believe they represent a standard method for measuring eating behaviour and food intake in children who do not exhibit self-feeding skills. Each child was compared to one another and explanations were provided regarding the data.

Level of Evidence – This study was a single subject design, using multiple baseline measurement, which is considered a moderately high level of evidence. Given the nature of the population, the data does provide valuable information regarding the effectiveness of behavioural programs in treating children with food refusal.

Byars, Burklow, Ferguson, O'Flaherty, Santoro, and Kaul (2003) examined nine children with Nissen fundoplication and feeding gastrostomy and treated them using a multicomponent program. This program included appetite manipulation, time-limited behavioral treatment, and parent training. The authors supported the belief that although gastrostomy tube feedings can provide adequate nutrition and hydration, they ultimately affect the progress of oral feeding. All participants underwent a preadmission clinical evaluation to assess appropriateness for intensive treatment aimed at weaning from gastrostomy feeding. A prospective clinical intervention with dependent measures was used to evaluate before treatment, after treatment, and at follow-up. Long-term effects were evaluated following therapy and then again several months post-therapy. Six of the nine children were weaned completely from gastrostomy feedings and there was an increase in the percentage of daily nutritional

needs that were consumed from posttreatment to posttreatment.

The results of the study showed that short-term intensive biobehavioral treatment was effective in improving oral feeding and weaning from gastrostomy tube feeding in children with Nissen fundoplication and feeding gastrostomy.

Methodological/procedural critique - While many authors (Werle et. al., 1993; Gutentag & Hammer, 2000;) stress the benefits of home programming, Byars et al. (2003) support inpatient hospitalization for intensive treatment of children with a long history of gastrostomy tube dependence. The researchers believe “that inpatient treatment provides an appropriate context for significant caloric intake restrictions that cannot be safely accomplished at home in the absence of medical monitoring” (pg. 479).

Because of the heterogenous nature of feeding challenges and food refusal, with respect to etiology and physical symptoms, most research has been based on single subject designs among children with a broad range of physical and developmental disabilities. In contrast, the cases used in Byars et al.'s (2003) study examined children with several common etiological factors. This may be beneficial when developing treatment outcomes for children with similar backgrounds such as a history of behavioural feeding resistance, complicated medical histories (i.e., GERD, fundoplication surgery, and gastrostomy tube placement).

Paired-sample t tests revealed that increases in oral intake and decreases in gastrostomy tube support were statistically significant from baseline to the posttreatment assessment and from baseline to the follow-up assessment. This statistically significant data provides strong evidence in support of the effectiveness of a multicomponent behavioural program for improving oral intake in children dependent on gastrostomy feedings.

Level of Evidence – This study was a repeated measures group design, which is considered a moderate level of evidence in comparison to a randomized clinical trial. Because of the type of population that was being studied, a randomized clinical trial most likely would not have been the best fit. Therefore, the authors' decision to proceed with this particular experimental design was appropriate (Portney and Watkins, 2000).

Werle, Murphy, and Budd (1993) evaluated the effects of a behavioral parent-training program on children with chronic food refusal using a nonconcurrent multiple baseline design. The study wanted to identify possible

factors that could be related to the maintenance of feeding challenges in the child's natural environment, which would allow researchers to evaluate treatment outcomes more comprehensively. Three children with a history of chronic food refusal participated in the study. Mothers were taught behavioral procedures such as specific prompts, positive reinforcement, and social praise. A feeding observation code was used to score videotaped mealtime sessions. Items included parental and child behaviours, and food groups and textures consumed. Those parental behaviours that were most relevant to the study were discussed further. In formal mealtime observations, temporary increases in food refusal in all 3 children were documented following the initiation of behavioural treatment. This decreased as treatment progressed.

Results demonstrated that behavioral treatment increased oral acceptance of target foods and also extended existing literature supporting the functional influence that parent training has on mother-child feeding relationships in the home. Although the findings suggest that parent training was functionally related to changes in the children's feeding behaviour, the authors recognized that confounding variables could have attributed to the children's increased oral acceptance.

Methodological/procedural critique - Werle et al. (1993) explored an area not commonly examined in the treatment of food refusal. Instead of looking at clinical case studies or single-subject experiments, the researchers wanted to see the effects of generalizing behavioural intervention beyond the hospital or clinical settings, specifically in the home. Some limitations of this study included an absence of follow-up data and the withdrawal of a mother and her child. Due to the lack of follow-up data, there is no evidence to support the lasting effects of the parent-training program. Additionally, it would have been beneficial to obtain the mothers' reactions regarding the treatment, whether fading occurred following a certain amount of months or whether food refusal was diminished.

Similar to De Moor et al.'s (2007) study, the authors employed the use of visual analysis to present their findings. Based on descriptive data (i.e. positive attention, intake of target/nontarget foods), it was suggested that behavioural parental training could help treat food refusal. However, results were not interpreted so readers could not say for certain that the behavioural parental training alone improved the children's oral intake. Several limitations were evident in this study and therefore, their findings could not be generalized. The evidence of this study may have been stronger with the use of statistically significant tests such as a celeration line or a 3SD Band Approach.

Level of Evidence – This study was a single subject design, using a baseline, which generally gives it a moderately high level of evidence; however, the lack of statistical analysis puts into question the strength of data provided. A stronger study could have included a larger number of subjects and follow-up data to demonstrate any long-term effects of parental training on feeding behaviours.

Gutentag and Hammer (2000) examined a 3-year-old girl with a complicated medical history and developmental disabilities using a multiple-phase design. Diet was given via a gastrostomy tube. A feeding program in the home and school settings was implemented. Treatment involved positive reinforcement (food acceptance was followed by social praise and access to preferred toy play) and ignoring of disruptive behaviors. Parents were trained on the appropriate procedures so the program could be implemented into the home. The results showed increases in the amount of food consumed at home.

Methodological/procedural critique - In comparison to the other studies reviewed, Gutentag and Hammer (2000) evaluated a single subject. It is considered to demonstrate a lower level of evidence than the other four studies based on fewer participants. Additionally, due to the child's medically fragile state, continuous modifications to the program were necessary. Because of the complications that occurred during this study, many reasons were given for the data that was obtained. For example, the child's range of daily oral intake (0-24 ounces) could have been related to various extraneous factors including a) inconsistent implementation of the intervention, b) illnesses, and c) child compliance issues. Although an improvement in oral intake was observed in the child, it is difficult to determine whether it was solely the result of the behavioural treatment, which puts into question the reliability of the study results.

Data was presented using visual analysis. A Pearson's product-moment correlation was employed to demonstrate a moderate inverse relationship between total food intake and illness. This provided moderately strong evidence (Portney et al., 2000) and supported the subject's illness as a factor during the periods of low-to-no oral intake. However, several limitations were evident in this study overall, specifically the authors acknowledged the difficulty in obtaining data in a natural setting. Dependent measures could have been included to strengthen the study's evidence in support of the effectiveness of a behavioral program on a child with feeding challenges. Additionally, statistically significant tests such as a celeration line or a 3SD Band Approach could have been implemented.

Level of Evidence – This study was a single subject design with a pretreatment baseline. Apart from the use of the Pearson's product-moment correlation, there was a lack of statistical analysis for the main objective of the study, which was to analyze the effects of a behavioural treatment program in a gastrostomy tube-dependent child. Many confounding variables with no controls were also present; therefore, this study is considered to demonstrate a lower level of evidence.

Discussion

With the exception of one study, there were at least two children evaluated in each study. Therefore, a limitation of the studies was the small number of participants. Several factors may have impacted the number of replications of studies. First, children with existing medical conditions or organic factors that could have interfered with feeding were excluded. Second, low referral rate at the time of study may have limited the number of participants. Some of the articles addressed the small sample size as a limitation to their study but did not provide further information.

The researchers pointed out the difficulty in data collection within natural settings. They noted that studies that looked at treatment of food refusal have many obstacles to overcome including lack of adult compliance and inconsistent or inaccurate data collection. They stressed the importance in providing education to the parents regarding data collection and its integral part in research outcomes (Gutentag et al., 2000).

Overall, while children may respond differently to various behavioural treatment methods, the studies reviewed provide a moderate level of evidence that suggest benefits in implementing a multicomponent behavioural program on improving oral intake in children with food refusal. However, results should be used with caution as all 5 studies recognized the need for more empirical research in the area of behavioural treatment programs, particularly in natural settings.

Recommendations

The above conclusions as well as the research explored in this review give rise to a series of new questions that require further research. The following recommendations should be considered for clinical practice.

- a) A knowledge of behavioral principles
- b) A working knowledge of empirically supported treatment techniques. In the studies reviewed,

contingency management techniques (i.e., positive and negative reinforcement) were most often practiced

- c) A good working relationship with referral sources
- d) Parental education for outpatient programs (e.g., teaching parents medical signs of low blood sugar or dehydration).
- e) Implementation of an inpatient program if it is perceived that there are difficulties with parental responsibility.

Additionally, it is recommended that future research evaluating the effectiveness of behavioural treatments on children with feeding challenges or food refusal consider the following.

- a) Standardized charts for improved parental recording involving outpatient programs
- b) Follow-up data on the long-term outcome of treatment
- c) Explicit behavioural definitions when used as dependent measures
- d) Modifying behavioural treatments so that they address and can account for practical concerns outside of clinical settings
- e) The use of paired t-tests to compare caloric intake which would strengthen evidence of increased oral intake
- f) Posttreatment measures of behavioural feeding resistance (i.e., parental stress and continued mealtime behaviour problems)

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