

## Behavior management techniques are designed to strengthen adaptive behaviors and weaken maladaptive behaviors

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### Behavioral Management of Feeding Disorders of Childhood by Alan H. Silverman

#### Key insights

Addressing childhood feeding disorders is key to fostering appropriate growth and cognitive development in early life and beyond. To this end, behavioral interventions are the cornerstone of treatment. Identifying and implementing the appropriate behavioral techniques requires the cooperation between pediatricians, psychologists, and parents in order to sustain long-term positive changes. To enhance the likelihood of a successful outcome, parents or caregivers need to be educated about the theory and applications of these techniques.

#### Current knowledge

Childhood feeding problems include food refusal, disruptive mealtime behavior, rigid food preferences, and inability to master self-feeding skills. The prevalence of childhood feeding problems is as high as 25–45% amongst the general population. In children with developmental disabilities or those with mental disorders, these estimates are between 30 and 80%. Such feeding problems are most frequently seen in the initial 1–3 years of life and can result in nutritional conditions such as rickets and scurvy. Nutritional disorders that occur during this critical period have adverse effects on cognitive development, school performance, memory, and emotional and behavioral regulation.

#### Practical implications

An important first step is to identify the feeding problem in order to clarify the treatment methods and objectives. Behavioral treatment strategies are the mainstay for the management of feeding disorders and are designed to reinforce positive behaviors and minimize maladaptive behaviors. These strategies include a combination of modifications of mealtime scheduling,



The application of behavioral interventions can be effective for managing childhood feeding disorders.

meal duration, and mealtime transitions, as well as positive reinforcement and discrimination training. It is important that parents and caregivers work alongside pediatric psychologists in order to understand the range of possible strategies and apply the correct type of behavioral intervention.

#### Recommended reading

Lukens CT, Silverman AH: Systematic review of psychological interventions for pediatric feeding problems. *J Pediatr Psychol* 2014;39:903–917.

# Behavioral Management of Feeding Disorders of Childhood

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## Key Messages

- The preponderance of evidence supports the use of behavioral interventions for the treatment of feeding disorders of childhood.
- Many behavioral techniques can be effectively taught to caregivers of affected children empowering families to manage these concerns in the home environment.
- Complex and severe feeding disorders may require interdisciplinary assessment and treatment.

## Key Words

Feeding disorder · Pediatrics · Assessment · Behavioral therapy · Parent training

## Abstract

Feeding disorders, characterized by suboptimal intake and/or lack of age-appropriate eating habits, are common and may be seen in up to 45% of children. Feeding disorders are a significant concern to both the affected families and to the providers who treat them. Fortunately, there are well-established behavioral treatments which have been shown to be highly efficacious. This article provides an overview of behavioral assessment and treatment of pediatric feeding dis-

orders, provides guidance in treatment planning, and provides information which may be useful in considering if additional psychological consultation may be beneficial.

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## Introduction

Feeding disorders are often seen in the first 1–3 years of life when the child has difficulty sustaining adequate growth, has inappropriate intake, or does not progress from one developmental feeding stage to the next. The primary concern of caregivers and clinicians is generally related to the child's nutritional status. For example, inadequate variety of the diet may result in nutritional disorders (e.g. scurvy, rickets, and kwashiorkor disease), whereas inadequate caloric intake may manifest as undernutrition with failure to thrive, in turn having adverse effects on cognitive development [1, 2], school achievement, attention and memory, and emotional and behavioral regulation [3, 4].

Specific feeding problems may include but are not limited to food refusal, disruptive mealtime behavior, rigid food preferences, suboptimal growth, and failure to master self-feeding skills commensurate with the child's developmental abilities. Prevalence estimates of feeding problems are alarmingly high, estimated to occur in as many as 25–45% of children in the general population [5,

6], in approximately one third of children with developmental disabilities [7], and in up to 80% of those with severe or profound mental retardation [8, 9]. Generally, younger children have more feeding problems than do older ones. However, the general trend is for untreated feeding problems to persist over time [10, 11]. Some research also shows that feeding problems may evolve into eating disorders in adolescence and adulthood [12]. Unfortunately, the prevalence of feeding disorders is expected to rise as the survival rates of premature babies and children with significant disease and/or developmental disabilities increase [13].

Treatment of feeding disorders is provided by a variety of health-care professionals from medicine, psychology, speech-language pathology, nutrition, and other specialties [14, 15]. The role of the psychologist is to provide a behavioral perspective on feeding disorders, assess for comorbid behavioral or psychiatric conditions within the child or within the broader family system, and to provide intervention or facilitate referrals as appropriate [15]. A pediatric psychologist (psychologist with specialized training in child health) is particularly well suited to work with feeding problems.

### **Behavioral Assessment and Treatment Planning**

Assessment should clarify a family's treatment objectives, identify components of the feeding problem, and determine if the family's goals are appropriate and achievable. Common behavioral concerns include comorbid psychiatric diagnoses, missed or delayed stages of feeding development, learned feeding avoidance due to aversive conditioning (e.g. choking event or force feeding history), frequency and severity of inappropriate mealtime interactions, behavioral refusals which may have been inadvertently reinforced by caregivers (allowing the child to self-select the diet), and inappropriate family or cultural expectations for feeding. Typically, assessment is comprised of a medical record review, caregiver-completed questionnaires, a clinical interview, and observation of the child while being fed [16].

#### *Medical Records and Questionnaires*

Behavioral assessment of a child's medical, developmental, and environmental status can be obtained in part by the use of condition-specific questionnaires. Feeding questionnaires have been developed to assess the severity of behavioral problems occurring during meals [17, 18], to assess the feeding relationship [19–21], to assess feeding skill deficits [22], and to assess special populations

[23]. Parents may also be asked to report on their own psychosocial functioning (e.g. Symptom Checklist-90 [24] and Parenting Stress Index [25]), which may be useful in gauging caregiver factors that affect feeding behaviors [23].

#### *Clinical Interview*

The clinical interview is used to clarify the family's concerns and to obtain information for making a diagnosis and developing treatment strategies. Interdisciplinary interviews are especially beneficial, as each provider benefits from questions asked by others during feeding assessments. Interviews focus on the child's medical and developmental history, feeding milestones, family mealtimes and daily routines, onset and nature of the specific feeding problems, and previous attempts at interventions. Questions regarding cultural meal practices can provide important information regarding the family's mealtime expectations, perception of feeding problems, and desire to engage in medical, behavioral, and/or other therapeutic interventions. During the interview, the psychologist also assesses the family's mental health history and current family stressors. A behavioral feeding assessment has been published by Budd et al. [26] which may be of use to individuals completing such assessments.

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#### *Mealtime Observation*

An observation of child and caregiver interacting during a meal is central to a feeding assessment [27]. The goal of the observation is to determine if the parent-child interaction is reinforcing the feeding problem (e.g. coaxing a child to eat). Typically, feeding observations are done in vivo, simulating a meal as it might occur at home. Ideally, a meal is simulated when the child would be expected to be hungry (e.g. after 2–4 h of fasting), with a behavioral specialist and a speech-language pathologist observing the interaction behind a one-way mirror or via a closed-circuit television to assess behavior and feeding-related skills while minimizing the ef-

fects of direct observation on the feeding interactions. Preferred and nonpreferred foods are presented while the psychologist records specific behaviors such as bites accepted and refusal frequency and severity. Observational scales have been developed to quantify interactions between children and caregivers [28], assess oral-motor functioning [29], and to assess mealtime interactions [30].

### *Treatment Planning*

Once the assessment has been completed, the team is able to match strategies to specified treatment objectives for the development of the treatment plans. Behavioral treatment goals generally consist of (1) increasing oral intake or variety of oral foods; (2) decreasing behavioral problems at meals; (3) increasing pleasurable parent-child interactions at meals; (4) decreasing parent stress at meals, and (5) advancement of developmentally appropriate intake (e.g. moving from purees and smooth foods to chewable solids) [15]. Careful consideration of the appropriateness of the treatment goals is an important component of the planning phase as both the family and the treatment team benefit from objectively defined and realistic care plans. Thus, it is important to establish behavioral treatment goals in consultation with other providers to ensure the safety and appropriateness of the methods which will be implemented.

### **Behavioral Treatment**

Considerable evidence supports the use of behavioral approaches in the treatment of feeding disorders [10, 31–34]. Behavioral treatment strategies typically include a combination of modifications to the mealtime schedule and structure, behavior management, and caregiver training. Ongoing consultation with other specialists, especially a dietitian and a speech-language pathologist, is frequently necessary to monitor the safety of the therapeutic plan that can result in transient weight loss or that may unmask oral-motor or swallowing deficits or other physiological limitations to feeding as behavioral resistance to feeding begins to resolve.

Behavior management techniques are designed to strengthen adaptive behaviors and weaken maladaptive behaviors. The essential elements of behavior manage-

ment are (1) to identify the targeted behavior for change; (2) to select techniques to increase or decrease behaviors congruent with feeding goals, and (3) to develop a treatment plan that consistently pairs a contingency (positive or negative) with the targeted behavior (fig. 1). Strategies to improve caregiver influence during meals include environmental controls which make modifications to the schedule of intake and setting characteristics of meals. Strategies to increase desirable feeding behaviors include the use of positive and negative reinforcement and discrimination training. Strategies to reduce negative feeding behaviors include extinction, satiation, punishment, and desensitization [33]. Most behavioral treatment plans will include a combination of techniques [34].

### *Environmental Interventions*

Meals that have a variety of foods, that are highly structured, and that are offered at fixed intervals are going to provide children with the strongest cues to eat well. In turn, we would expect that children receive the appropriate amount of nutrition for their growth needs. Environmental interventions (table 1) tend to be easy for families to implement with relatively little support required from treatment specialists, which makes these techniques particularly well suited to treatment planning when access to therapeutic services is limited. To succeed with these interventions, families need to know what types of foods to offer, what the mealtime schedule should be, and how the feeding environment should be arranged.

*A developmentally appropriate diet* matches a child's feeding skills with appropriate texture and volumes of foods offered. The American Academy of Pediatrics [35] has published guidelines recommending texture advances by age. However, there may be individual variation in the progression of feeding stages of development. Families may require consultation to understand how to identify their child's developmental stage, what their child's eating skills are, and how to accurately identify hunger and satiation cues. One simple way to estimate a child's readiness to advance their diet may be to consider their gross motor development as a proxy for their feeding skills. If a child is showing signs of gross motor delay or has a delayed advance of diet, a referral for a feeding skill

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(I) **The best goals are SMART**

**Specific** – What will you do, when, where, and with whom?

**Measurable** – How will you know when you meet your goal?

**Action focus** – What will you do? (Not what you want to change).

**Realistic** – Can you really do this? Can you do it at this time?

**Timely** – Are you ready to do this NOW?

**My feeding goal is:**

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(II) **Pick a reward**

Changing eating habits is hard work! It is easier for kids to achieve their goals if they get a reward for doing it. Choose something that you and your child can do together immediately after the goal is reached (e.g. give a hug or a kiss, a sticker to track progress on a chart, blow bubbles for each successful bite, or consider something after the meal that doesn't involve food such as playing a favorite game together or going to the park together).

My feeding rewards will be:

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(III) **Extinguishing strategies**

If rewards are not working, consider techniques to reduce problem feeding behaviors. Remember these techniques must be used consistently to work best (e.g. ignore fussing about foods, present the food until accepted and once accepted give your child a 30-second break).

My extinguishing strategies will be:

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Now track your child's progress over the next few days keeping in mind that it may take several attempts to see progress! Try combining these techniques to have the greatest effect! Call your treatment team if you have any questions.

**Fig. 1.** Setting goals and selecting a behavioral management strategy.

evaluation with a qualified pediatric speech and language pathologist may be warranted.

Another simple technique for countering a child's resistance to new or unfamiliar foods is *repeated exposure* or to repeatedly offer the foods by placing them on the child's plate with an expectation that the child will explore and take small tastes of the food. Previous research has shown that preferences for novel foods increase markedly after approximately 10 exposures, regardless of the taste of the food, but that children must actually taste the new foods to change preference judgments, rather than simply looking at them or smelling the foods [36]. While there are currently no published data describing the number of exposures needed to build food preferences in chil-

dren with feeding disorders, it is presumed that gradually repeated exposures will promote preference even in clinical populations.

*Interventions which focus on the schedule and duration of meals* capitalize on a child's hunger and satiation cycle. By systematically controlling when and for how long food is offered, the caregiver can influence a child's appetite, thereby fostering an internal drive to feed [33]. Beyond 2 years of age, most children will consume three meals interspersed with one to three light snacks per day. A period of 3–4 h between meals appears optimal for appetite regulation [37]. This time interval typically results in positive sensations in anticipation of food without the physical discomfort of extreme hunger. To encourage the intake

**Table 1.** Environmental control

Environmental strategy	Definition	Examples of interventions
Developmentally appropriate diet	Matching a child's developmental and oral motor skills with appropriate textures well suited to facilitate the child's ability to eat a well-balanced diet	Referring to the Academy of Pediatrics recommendations for textures Evaluation of developmental delays which may necessitate adaptation to match the developmental ability of the child
Repeated exposure	Repeated offerings of new/nonpreferred foods at challenge meals and snacks	Attempting to complete 10 or more exposures to a food before changing to a new challenge Children must taste challenge foods at specified meals and snacks
Schedule and duration of meals	Feeding a child on a fixed schedule of meals and snacks with periods of no caloric intake between scheduled feedings to induce hunger	Meals and snacks scheduled at least 3 h apart Meal duration not to exceed 30 min
Stimulus control	Manipulation of mealtime environmental factors known to increase desirable behaviors and reduce problem behaviors within the meal. These techniques do not require specific training in applied behavioral strategies but do require nutritional monitoring to ensure safety of use	All meals at the table Child securely seated in an appropriate chair Rigid meal time schedule Meal free from distractions (e.g. TV, toys) Elimination of grazing between meals Decrease in supplemental feedings Allow the child to 'fail' a meal to experience the natural consequence of increased hunger
Mealtime transition	Strategies which facilitate a child's transition to the mealtime environment. Typically, families are advised to avoid active or strongly preferred activities just before the meal as this may contribute to a child's resistance to the transition	Quiet or less desirable activities preceding the meal Ritual activities preceding the meal (e.g. washing hands, giving thanks) Pleasant activity planned if the child reaches meal objectives

of a broad range of foods, only a small amount of a preferred food should be offered at the scheduled feeding time, at least until after nonpreferred foods have been consumed [33].

Generally, clinicians suggest that the duration of mealtimes for children be between 10–25 min (or up to 45 min for children with physical impairments affecting eating) [16]. Shorter meals have been associated with undernutrition and long mealtimes have been associated with behavioral feeding problems; however, problems with meal duration are likely to be symptoms of an underlying behavioral problem [29]. Interventions to reduce excessive meal length include use of a timer or marking the hands of a clock as a visual reminder of when mealtimes will be over [33]. Caregivers should avoid using timers and clocks which are digital as the units of time of these devices may be difficult for the child to interpret. Rather, wind-up timers or sand timers are particularly useful with young children. Once the meal is ended, it is important

not to provide the child with food or beverages (other than water) for a period of at least 2 h, in order to establish a clear discrimination between eating and noneating occasions and to promote greater hunger before the next scheduled feeding period.

Meal setting characteristics or *environmental control* can exert facilitative or detrimental effects on children's behavior. Typically, clinicians will evaluate attributes of the feeding setting including physical surroundings, feeding position and body support, and activities preceding and following eating. Generally, a solitary location devoid of visual or auditory distractions (e.g. no television, computers, and/or other screen time activities) may be most conducive to eating [33]. This also helps children to focus on their parents as a source of feedback, facilitating a caregiver's ability to manage the meal. Caregivers are advised to serve meals in a consistent eating area, to restrict the people present to those who are eating, and to prohibit toys or activities as they typically disrupt eating. It

**Table 2.** Increasing behavior

Increasing behavior strategies	Definition	Examples of interventions
Positive reinforcement	Increases the frequency of a desirable feeding behavior due to the <i>addition</i> of a reward immediately following the desired feeding response	Cheering for a child who tastes a new food Giving a sticker as a reward for reaching a food volume goal Offering a preferred food after the child accepts a new or nonpreferred food
Negative reinforcement	Increase the frequency of a desirable feeding behavior when the consequence is the <i>removal</i> of an aversive stimulus immediately following the desired feeding response	Avoidance conditioning occurs when a behavior prevents an aversive stimulus from starting or being applied (e.g. if a new food is accepted, the child will not have an increase in the total number of bites needed to reach the bite goal) Escape conditioning occurs when behavior removes an aversive stimulus that has already started (e.g. release of a physical restraint when the child accepts the food presented)
Discrimination training	This technique teaches the individual that specified behaviors will be reinforced in the presence of a defined stimulus. The reinforcement schedule or the targeted behavior may evolve to build more complex behaviors	Positively reinforcing requested feeding behaviors but not other behaviors observed during the meal Modeling a desired feeding behavior and then praising when the behavior is exhibited by the child Shaping a behavior by reinforcing successive approximations of a more complex or higher-order behavior

may also be advisable to limit the number of feeders to one or two people who are trained in the feeding procedure, especially early in intervention.

Body positioning may also have significant effects on a child's eating habits. A secure, well-balanced posture during meals is recommended as it typically enhances a child's motor coordination and attention to feeding. As part of the intervention, parents are often told to seat children securely for meals (e.g. high chair with strap) [16]. Children with physical disabilities may need additional modifications in feeding positions to provide for optimal alignment of head, neck, and trunk and may benefit from evaluation by a pediatric occupational therapist.

Many caregivers report that *mealtime transitions* are among the most difficult aspects of feeding their child. The type of activity immediately preceding meals may have direct effects on the transition and perhaps on the entire meal, particularly when the child perceives the preceding activity as enjoyable in contrast with the child's perceptions regarding the challenges of mealtime. Clinicians should advise families to engage in quiet activities preceding meals and encourage families to establish a routine to facilitate the transition into the meal (e.g. washing hands) [38]. Similarly, families should select an activity that the child looks forward to at the completion of the meal, contingent upon reaching mealtime objectives. Families should avoid offering a strongly preferred

activity after the meal without a clear *exit criterion* [10] as this may result in a child attempting to hasten the meal resulting in poor intake. Exit criteria make use of the Premack principle [39] in which individuals will perform less desirable activities to earn a more desirable activity (e.g. after you have eaten your vegetables, we will go to the park).

#### *Increasing Desirable Feeding Behavior*

Similarly to environmental interventions, strategies to increase desirable feeding behaviors are generally easy to understand and to implement for caregivers in the home environment. However, these strategies typically require parent training and ongoing consultation with a pediatric psychologist to ensure success (table 2).

*Positive reinforcement* is the delivery of a reward (e.g. praise, stickers, points toward a reward, or a preferred food), contingent on performance of a target behavior (e.g. increased volume of food, exploration of new/non-preferred food), that strengthens the probability that the target behavior will occur in the future [33]. Typically, attention from an adult caregiver is the most common method of reinforcement, as attention is easily delivered and highly sought after by children. For older children, the use of tangible reinforcement such as a sticker chart or point system in which points can be accumulated to earn prizes or privileges may be more motivating [40].

**Table 3.** Decreasing behavior

Interventions to decrease behaviors	Definition	Examples of interventions
Extinction	Reduces the frequency of an undesired feeding behavior due to the <i>removal</i> of a reward immediately following the undesired feeding response	Ignoring inappropriate feeding behaviors Continuing to prompt desired feeding behavior
Punishment	Reduces the frequency of an undesired feeding behavior by presenting an aversive stimulus or removing a rewarding stimulus as a consequence of undesired behavior	The child receives a verbal rebuke for noncompliance The child is given a timeout Preferred activities or toys are withheld after the meal
Desensitization	The negative behavior is reduced by pairing repeated exposures to the aversive stimulus (e.g. new or nonpreferred food) in the absence of an aversive event or with the presence of a positive reinforcer	The child's physiological anxiety response is reduced after numerous exposures Distraction techniques may be paired with the exposures (e.g. plays with preferred toy) Relaxation techniques may be used to reduce or eliminate anxiety response when the child is presented with the feared stimulus

For these techniques to be effective, the reward must be motivating enough to change feeding behavior, and the caregivers and the child must understand and follow the reinforcement schedule.

*Negative reinforcement* involves terminating or withholding an aversive stimulus contingent on performance of a desired behavior, with the result that it strengthens the probability that the desired behavior will occur in the future. As negative reinforcement involves the use of aversive stimuli, these techniques are typically only used in more intensive therapeutic settings (e.g. inpatient or day treatment) under the direct supervision of a psychologist. Perhaps the most commonly used form of negative reinforcement is the use of *physical guidance* (also called contingency contacting or chin or jaw prompting) to induce a child to accept or swallow a bite of food [41–44]. In practice, a child is offered a bite of food, if he or she refuses the food the feeder physically guides the food to the child's lips or into the child's mouth and holds the jaw until the bite is accepted and swallowed. Termination of the physical guidance (the aversive stimulus) occurs when the child accepts the food (the desired behavior). With continued use of this technique, the child learns to avoid the use of physical guidance by accepting the food at the first presentation.

*Discrimination training*, also known as *differential reinforcement*, teaches the child that targeted desirable feeding behaviors (e.g. bite acceptance, self-feeding) will be reinforced while nondesirable feeding behaviors (e.g.

crying, tantrums) will be selectively ignored [45]. *Modeling* (demonstration of a desired feeding behavior and then praising when the behavior is exhibited by the child) and *shaping and fading* (reinforcing successive approximations of a more complex or higher-order behavior) are commonly used in discrimination training [46]. *Texture fading*, a procedure in which food textures are systematically increased [47], and *graduated guidance for self-feeding* [48] and *least to most prompts for self-feeding* [49], methods to help children progress to age-appropriate self-feeding, are techniques which rely on discrimination training methods. Given the potential complexity of these strategies, consultation with a psychologist and a speech-language pathologist and/or occupational therapist is typically recommended prior to attempts to implement these techniques in the home.

#### *Decreasing Undesirable Feeding Behaviors*

Unlike environmental strategies and strategies to increase desirable feeding behavior, strategies to decrease undesirable feeding behaviors may be more difficult for caregivers to implement. These strategies typically require parent training and ongoing consultation with a pediatric psychologist to ensure success (table 3).

*Extinction* is the systematic withholding of a reward following a problem feeding behavior which has been targeted for elimination. The most common example of extinction, in a feeding disorder treatment context, is to ignore undesired child behaviors such as refusals or tan-



trums [32, 50]. Often, extinction techniques are difficult for parents to implement, and learning these techniques may require in vivo training for caregivers which might include modeling, behavior reversal, and practice to refine caregivers' skills and to provide emotional support during intervention.

*Punishment* is the delivery of an aversive stimulus (or the removal of a rewarding stimulus) that weakens the probability that the response will occur. Punishment procedures involving highly aversive stimuli are recommended only when less intrusive procedures are not successful, the target behavior is damaging to the child or others, and when carefully monitored by trained personnel. Perhaps the most commonly used punishment technique is *timeout from positive reinforcement* [51]. In a feeding context, the child may be turned or moved away from the table to eliminate any reinforcement from the child's refusals. Timeout at the table is commonly used because it is safe and highly effective. Another form of punishment is *verbal correction* (a firm 'NO') followed by several seconds of attention withdrawal. In some cases, negative verbal attention may, in fact, serve as a positive reinforcer and, therefore, it is essential to monitor the effects of delivering the punishment to determine whether the technique is actually effectively decreasing the target behavior. *Response-contingent withdrawal of positive reinforcement* [52] and *response cost for refusal* [53] are other forms of punishment. Typically, these techniques involve the withdrawal of toys or other preferred stimuli during a meal or at the end of a meal as a consequence of misbehavior. To be most effective, the child should have the opportunity to regain access to the preferred stimuli by engaging in cooperative behavior either at the meal or at a subsequent meal. Finally, *overcorrection*, a procedure in which the child is physically directed through a series of repetitive, presumably unpleasant acts, has also been used as another form of punishment [54]. This technique is frequently used for children who intentionally throw foods or spit up during meals.

Some behavioral interventions may be too aversive for parents to implement or may inadvertently increase the frequency and severity of behavioral problems if implemented incorrectly, such as *swallow induction* [55], which elicits a swallow by stimulating the back of the throat.

Also, *avoidance conditioning* has been effectively applied as a punishment technique to reduce a problem behavior (e.g. expelling and psychogenic vomiting) by pairing a more extreme aversive consequence such as mouthwash (to brush a child's teeth or to be dabbed on the child's lips) or *re-presentation* (the refeeding of expelled foods) [44]. However, careful consideration of the use of these techniques should be made with a feeding specialist prior to use as there is a relatively high risk of increasing aversion if the techniques are used improperly.

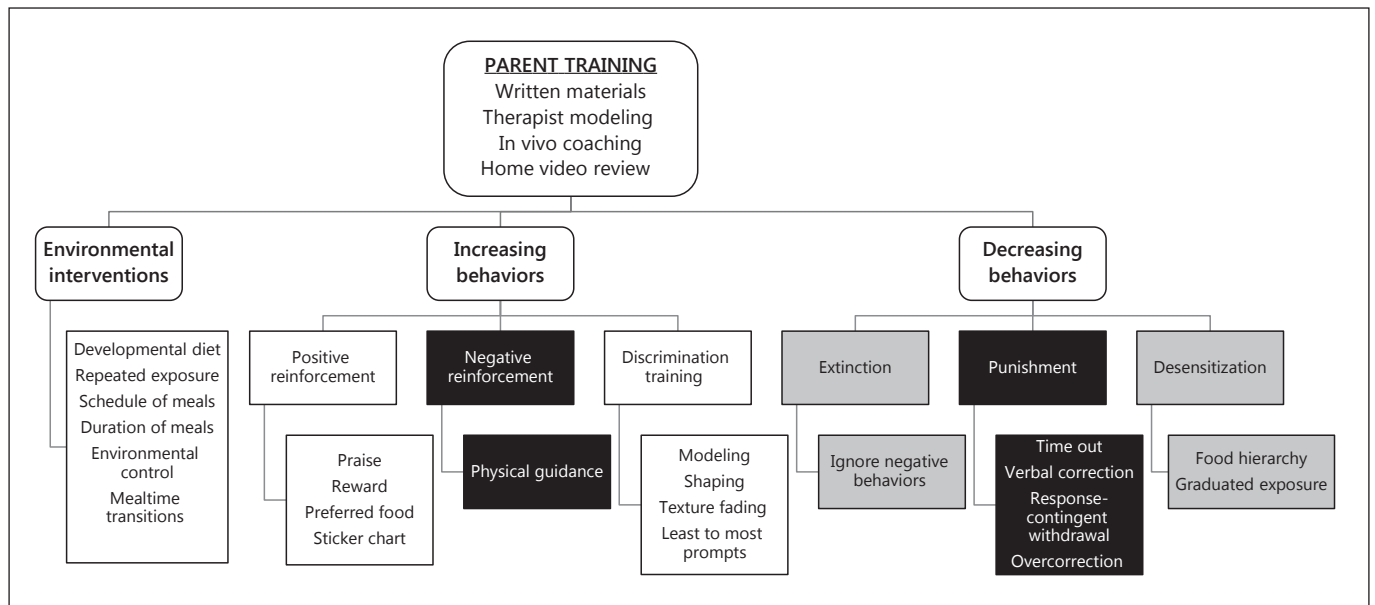
Occasionally, a child will have a history of aversive feeding events which underlies the negative feeding behaviors, which become the target of treatment (e.g. gagging, choking, vomiting, or force feeding). To reverse the effects of aversive conditioning, *desensitization* procedures are often used [56]. Desensitization is the repeated pairing of the conditioned aversion with the absence of the aversive event, generally with the additional delivery of a positive reinforcement as an

alternative, adaptive response. Generally, desensitization includes graduated exposure to the stimuli in nonthreatening conditions. Within a feeding context, a hierarchy of exposure may be developed to gradually shape the child's acceptance of new or nonpreferred foods.

#### *Parent Training*

Parents typically learn interventions from providers and ultimately implement these recommendations in the home environment (fig. 2). To enhance the likelihood of a successful treatment outcome, parents need to be educated about the basic theory and applications of behavioral techniques [13]. Frequently, parent training includes education on how adaptive and maladaptive behaviors develop and become reinforced, how to assess antecedents and consequences as they affect behavior, and how to use basic behavioral interventions to effect change. Parent training often includes: (1) the provision of written information including descriptions of intervention techniques to be used; (2) a therapist modeling intervention techniques during a simulated meal; (3) in vivo coaching – directly with the child in the room or through remote coaching (e.g. behind a one-way mirror) – to refine parent skills, and (4) review of video-recorded feeding in the natural environment in which the child eats [16].

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**Fig. 2.** Behavioral methods appropriate for parent training. Methods in white are suitable for families to implement at home with education and ongoing consultation. Methods in grey are suitable for families to implement at home with regular contact with the treatment team. Methods in black may not be suitable for home use and require close contact with the treatment team for any use.

## Summary

Feeding problems are common and represent a cluster of symptoms which are often of significant concern to families and pediatricians alike. Community providers are frequently the first individuals to evaluate and treat these concerns. Behavioral treatment approaches have been shown to be highly effective and safe in the treatment of a variety of feeding problems. Unfortunately, access to pediatric psychologists with specialty training in the treatment of feeding problems remains a bar-

rier to care. Knowledge of the range of behavioral interventions should help community providers know how to select techniques that can be safely implemented and when to request additional help from behavioral specialists.

## Disclosure Statement

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## References

- 1 Drotar D, Sturm L: Prediction of intellectual development in young children with early histories of failure to thrive. *J Pediatr Psychol* 1988;13:281-295.
- 2 Galler JR, Ramsey F, Solimano G, et al: The influence of early malnutrition on subsequent behavioral development: I. Degree of impairment in intellectual performance. *J Am Acad Child Psychiatry* 1983;22:8-15.
- 3 Polan HJ, Leon A, Kaplan MD, et al: Disturbances of affect expression in failure-to-thrive. *J Am Acad Child Adolesc Psychiatry* 1991;30:897-903.
- 4 Wolke D, Skuse D, Mathisen B: Behavioral style in failure-to-thrive infants: a preliminary communication. *J Pediatr Psychol* 1989;15:237-254.
- 5 Bentovim A: The clinical approach to feeding disorders of childhood. *J Psychosom Res* 1970;14:267-276.
- 6 Forsyth BWC, Leventhal JM, McCarthy PL: Mothers' perceptions of problems of feeding and crying behaviors: a prospective study. *Am J Dis Child* 1985;139:269-272.
- 7 Gouge AL, Ekvall SW: Diets of handicapped children: physical, psychological, and socioeconomic correlations. *Am J Ment Defic* 1975;80:149-157.
- 8 Manikam R, Perman JA: Pediatric feeding disorders. *J Clin Gastroenterol* 2000;30:34-46.
- 9 Perske R, Clifton A, McLean B, et al (eds): *Mealtimes for Severely and Profoundly Handicapped Persons: New Concepts and Attitudes*. Baltimore, University Park Press, 1977.
- 10 Babbitt RL, Hoch TA, Coe DA: Behavioral feeding disorders; in Tuchman DN, Walters RS (eds): *Disorders of Feeding and Swallowing in Infants and Children*. San Diego, Singular, 1994, pp 77-95.

- 11 Dahl M, Sundelin C: Feeding problems in an affluent society. Follow-up at four years of age in children with early refusal to eat. *Acta Paediatr* 1992;81:575-579.
- 12 Marchi M, Cohen P: Early childhood eating behaviors and adolescent eating disorders. *J Am Acad Child Adolesc Psychiatry* 1990;29:112-117.
- 13 Silverman AH, Tarbell S: Feeding and vomiting problems in pediatric populations; in Roberts MC, Steele RG (eds): *Handbook of Pediatric Psychology*. New York, Guilford Press, 2009, pp 429-445.
- 14 Burklow KA, Phelps AN, Schultz JR, et al: Classifying complex pediatric feeding disorders. *J Pediatr Gastroenterol Nutr* 1998;27:143-147.
- 15 Fischer EA, Silverman AH: Behavioral conceptualization, assessment, and treatment of pediatric feeding disorders. *Semin Speech Lang* 2007;28:223-231.
- 16 Silverman AH: Interdisciplinary care for feeding problems in children. *Nutr Clin Pract* 2010;25:160-165.
- 17 Berlin KS, Davies WH, Silverman AH, et al: Assessing children's mealtime problems with the Mealtime Behavior Questionnaire. *Child Health Care* 2010;39:142-156.
- 18 Archer LA, Rosenbaum PL, Streiner DL: The children's eating behavior inventory: reliability and validity results. *J Pediatr Psychol* 1991;16:629-642.
- 19 Davies WH, Ackerman LK, Davies CM, et al: About Your Child's Eating: factor structure and psychometric properties of a feeding relationship measure. *Eat Behav* 2007;8:457-463.
- 20 Musher-Eizenman D, Holub S: Comprehensive feeding practices questionnaire: validation of a new measure of parental feeding practices. *J Pediatr Psychol* 2007;32:960-972.
- 21 Johnson SL, Birch LL: Parents' and children's adiposity and eating style. *Pediatrics* 1994;94:653-661.
- 22 Ramsay M, Martel C, Porporino M, Zygmuntowicz C: The Montreal Children's Hospital Feeding Scale: a brief bilingual screening tool for identifying feeding problems. *Paediatr Child Health* 2011;16:147-e17.
- 23 Lukens CT, Linscheid TR: Development and validation of an inventory to assess mealtime behavior problems in children with autism. *J Autism Dev Disord* 2008;38:342-352.
- 24 Derogatis LR: *Symptom Checklist-90-Revised (SCL-90-R): Administration, Scoring, and Interpretation Manual*. Towson, Clinical Psychometric Research, 1983.
- 25 Abidin R: *Parenting Stress Index - Short Form*. Odessa, Psychological Assessment Resources, 1995.
- 26 Budd KS, McGraw TE, Farbisz R, et al: Psychosocial concomitants of children's feeding disorders. *J Pediatr Psychol* 1992;17:81-94.
- 27 Linscheid TJ, Budd KS, Rasnake LK: Pediatric feeding problems; in Roberts MC (ed): *Handbook of Pediatric Psychology*. New York, Guilford Press, 2003, pp 481-498.
- 28 Barnard KE, et al: Measurement and meaning of parent-child interaction; in Morrison F, Lord C, Keating D (eds): *Applied Developmental Psychology*. New York, Academic Press, 1989, pp 40-76.
- 29 Mathisen B, Skuse D, Wolke D, et al: Oral-motor dysfunction and failure to thrive among inner-city infants. *Dev Med Child Neurol* 1989;31:293-302.
- 30 Sanders MR, Patel RK, Le Grice B, et al: Children with persistent feeding difficulties: an observational analysis of the feeding interactions of problem and non-problem eaters. *Health Psychol* 1993;12:64-73.
- 31 Kerwin ME: Empirically supported treatments in pediatric psychology: severe feeding problems. *J Pediatr Psychol* 1999;24:193-214.
- 32 Palmer S, Thompson RJ Jr, Linscheid TR: Applied behavior analysis in the treatment of childhood feeding problems. *Dev Med Child Neurol* 1975;17:333-339.
- 33 Linscheid TR: Behavioral treatments for pediatric feeding disorders. *Behav Modif* 2006;30:6-23.
- 34 Lukens CT, Silverman AH: Systematic review of psychological interventions for pediatric feeding problems. *J Pediatr Psychol* 2014;39:903-917.
- 35 American Academy of Pediatrics, Committee on Nutrition, Kleinman RE: *Pediatric Nutrition: Policy of the American Academy of Pediatrics*, ed 7. Elk Grove Village, American Academy of Pediatrics, 2014, pp xxvi, 1477.
- 36 Birch LL, Fisher JA: Appetite and eating behavior in children. *Pediatr Clin North Am* 1995;42:931-953.
- 37 Trahms CM, Pipes PL: *Nutrition in Infancy and Childhood*, ed 6. New York, WCB/McGraw-Hill, 1997, pp xv, 458.
- 38 Handen BL, Mandell F, Russo DC: Feeding induction in children who refuse to eat. *Am J Dis Child* 1986;140:52-54.
- 39 O'Brien S, Repp AC, Williams GE, et al: Pediatric feeding disorders. *Behav Modif* 1991;15:394-418.
- 40 Sisson LA, Dixon MJ: Improving mealtime behaviors through token reinforcement. A study with mentally retarded behaviorally disordered children. *Behav Modif* 1986;10:333-354.
- 41 Riordan MM, Iwata BA, Finney JW, et al: Behavioral assessment and treatment of chronic food refusal in handicapped children. *J Appl Behav Anal* 1984;17:327-341.
- 42 Hoch T, Babbitt RL, Coe DA, et al: Contingency contacting: combining positive reinforcement and escape extinction procedures to treat persistent food refusal. *Behav Modif* 1994;18:106-128.
- 43 Ahearn WH, Kerwin ML, Eicher PS, et al: An alternating treatments comparison of two intensive interventions for food refusal. *J Appl Behav Anal* 1996;29:321-332.
- 44 Coe DA, Babbitt RL, Williams KE, et al: Use of extinction and reinforcement to increase food consumption and reduce expulsion. *J Appl Behav Anal* 1997;30:581-583.
- 45 Dahlquist LM: The treatment of persistent vomiting through shaping and contingency management. *J Behav Ther Exp Psychiatry* 1990;21:77-80.
- 46 Greer RD, Dorow L, Williams G, et al: Peer-mediated procedures to induce swallowing and food acceptance in young children. *J Appl Behav Anal* 1991;24:783-790.
- 47 Shore BA, Babbitt RL, Williams KE, et al: Use of texture fading in the treatment of food selectivity. *J Appl Behav Anal* 1998;31:621-633.
- 48 Stimbert VE, Minor JW, McCoy JF: Intensive feeding training with retarded children. *Behav Modif* 1977;1:517-530.
- 49 Piazza CC, Anderson C, Fisher W: Teaching self-feeding skills to patients with Rett syndrome. *Dev Med Child Neurol* 1993;35:991-996.
- 50 Stark LJ, Powers SW, Jelalian E, et al: Modifying problematic mealtime interactions of children with cystic fibrosis and their parents via behavioral parent training. *J Pediatr Psychol* 1994;19:751-768.
- 51 MacArthur J, Ballard KD, Artinian M: Teaching independent eating to a developmentally handicapped child showing chronic food refusal and disruption at mealtimes. *Aust NZ J Dev Disabil* 1986;12:203-210.
- 52 Larson KL, Ayllon T, Barrett DH: A behavioral feeding program for failure-to-thrive infants. *Behav Res Ther* 1987;25:39-47.
- 53 Kahng S, Tarbox J, Wilke AE: Use of a multicomponent treatment for food refusal. *J Appl Behav Anal* 2001;34:93-96.
- 54 Duker PC: Treatment of food refusal by the overcorrective functional movement training method. *J Behav Ther Exp Psychiatry* 1981;12:337-340.
- 55 Lamm N, Greer RD: Induction and maintenance of swallowing responses in infants with dysphagia. *J Appl Behav Anal* 1988;21:143-156.
- 56 Siegel LJ: Classical and operant procedures in the treatment of a case of food aversion in a young child. *J Clin Child Psychology* 1982;11:167-172.