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Combining Stimulus Fading, Escape Extinction, and Differential Reinforcement to Treat Food Selectivity in Children with Autism Spectrum Disorders

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COMBINING STIMULUS FADING, ESCAPE EXTINCTION, AND DIFFERENTIAL REINFORCEMENT TO TREAT FOOD SELECTIVITY IN CHILDREN WITH AUTISM SPECTRUM DISORDERS

By

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Submitted in Partial Fulfillment of the Requirements for the
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According to numerous anecdotal reports from parents, feeding problems are common in children with autism spectrum disorders (ASD). Recent literature appears to back up these claims. A recent study on the last 25 years of literature on food selectivity and nutritional adequacy in children with autism spectrum disorders states, “Parents of children with autism spectrum disorders often report that their children are highly selective eaters, with very restricted repertoires of food acceptance, which can be limited to as few as five foods” (p.238). (Cermak, Curtin, & Bandini, 2010). Another study confirms the decreased levels of food acceptance among children with autism and pervasive developmental disorder – not otherwise specified (PDD-NOS) by reporting that studies suggest around 50% of children who have autism spectrum disorders have high levels of selectivity by food category or texture. (Ahearn, Castine, Nault, & Green, 2001). In combination with multiple case studies and anecdotal reports that support that food selectivity is a problem in children with autism spectrum disorders, a study done by Schreck and colleagues in 2004 compared food selectivity in children who have ASD to typically developing children by having parents complete a food preference inventory. The parents of children with an autism spectrum disorder reported their children refused significantly more foods, had a less varied diet, and were more likely to accept low-texture foods such as pureed foods (Schreck, Williams, & Smith, 2004). Feeding issues in children with ASD have health implications as well as family quality of life implications.

The health of children with ASD with feeding difficulties may be at risk. According to Cermak and colleagues, 2010, restricted intake in children with food

selectivity causes concern for nutritional adequacy; however, different studies have produced conflicting results. Some studies have reported children with ASD and restricted food intakes to be below, above, and the same as children without ASD. Regardless, management of food selectivity and concerns for proper nutrition have been found to be major reasons for children to nutrition services. (Cermak, Curtin, Bandini, 2010). A report by Keen, 2007 mentioned early feeding difficulties may disrupt the process of learning to eat and accepting new foods during a window of opportunity critical for oral-sensory and oral-motor development. Keen also mentioned the relationship between low weight, height, skeletal maturation and the increased rate of psychiatric disturbance in children. The author stated, "Under-nutrition may therefore exacerbate subtle early manifestations of abnormal social behaviors, sensory responsiveness and obsessive behavior, contribution to a more extreme clinical picture…" (p.214). (Keen, 2007).

In addition, troublesome mealtime behaviors may negatively impact family quality of life. According to a literature review by Twachtman-Reilly and colleagues, "Even if the restrictive eating habits of a child with ASD do not adversely affect his or her health, they may nonetheless have a strong negative impact on the feeding experience" (p.264). (Twachtman-Reilly, Amaral, & Zebrowski, 2008). McCartney and colleagues reported that food selectivity and the often co-occuring mealtime behavior problems (e.g. aggression, tantrums, throwing food) result in significant problems for many families. (McCartney, Anderson & English, 2005).

Because children with autism spectrum disorders who exhibit problems with food selectivity issues may be at risk for nutritional deficiencies, health complications, and may pose mealtime behaviors that are difficult for caregivers to manage, research into the most effective interventions is warranted. The area of feeding disorders in children with ASD is relevant to speech-language pathologists in clinical setting who will be required to assist the child in increasing consumption of foods. Being familiar with the suspected reasons for food selectivity in ASD is also helpful to speech-language pathologists working in schools where less severe food selectivity issues may be presented. SLPs may be required to make meal-time modifications and incorporate social stories for older children with ASD with food selectivity and difficult meal time behaviors.

In children of concern with severe food refusal, combining escape extinction, differential reinforcement, and stimulus fading as a treatment for children with autism may prove to be the most effective intervention in most clinical cases. According to McCartney et al, 2005, differential reinforcement and escape extinction are commonly used to treat food refusal and food selectivity. Differential reinforcement involves reinforcing desired behaviors and not reinforcing problem behaviors. Positive reinforcement may include access to a preferred toy, a bite of a preferred food, or positive attention. Negative reinforcement would include temporarily reducing feeding demands. Escape extinction involves no longer allowing the child to escape from the eating demand contingent on problem behavior. (McCartney et al., 2005). Although each intervention used on its own may increase food consumption and compliance

during mealtimes, combining the three interventions simultaneously may produce the best results.

Differential Reinforcement and Stimulus Fading

Hagopian, Farrell, and Amari, (1996) investigated the impact of stimulus fading, differential reinforcement, and backward chaining on fluid refusal in a child with autism, mental retardation, and a history of severe gastrointestinal problems. The researchers believed the child with autism would respond favorably to treatment and increase his fluid consumption. Josh, the subject receiving therapy, was admitted to an inpatient unit because of his total food and liquid refusal and nasogastric tube dependency. A fading procedure was used to increase the amount of water presented to Josh from a syringe. While working with a therapist, he was instructed to swallow the water to obtain reinforcement. After he was accepting 3cc from a syringe, he was expected to drink that amount from a cup until the amount of water was able to be increased to 30cc. After reaching 30cc of water, juice was gradually faded in. A reversal design where behavior was measured at baseline, after treatment was introduced, and again when treatment was withdrawn, was used to demonstrate functional control by presenting a 10cc cup of water periodically. During the baseline, Josh had 0% successful trials of drinking 10cc from a cup. Josh gradually displayed less avoidance behavior and successfully worked his way up to consuming 90cc of water and juice by the 70th session. The authors of this study demonstrated the effectiveness of a combination of therapies on a child with total food and liquid refusal. Not only was the amount of water slowly increased, but backwards

chaining was used to allow Josh to successfully drink from a cup instead of a syringe. When the 10cc cup was probed multiple times before Josh had reached that amount in therapy, he was unsuccessful in drinking it, suggesting functional control. Another indication the therapist had established functional control was the lack of increased fluid consumption while Josh had to temporarily withdraw from treatment because of medical issues. He began to progress again after the intensive therapy resumed. After successfully completing all phases of treatment, Josh's progress generalized to his living unit where he was consuming 90cc of water and juice orally (Hagopian, Farrell, & Amari, 1996). Although Josh made significant gains in his liquid acceptance, threats to the external validity of this study exist because of the single-subject design. Results may not generalize to the population.

Luiselli, Ricciardi, and Gilligan (2005) investigated the success of using a liquid fading procedure and differential reinforcement with a 4-year-old girl with autism to establish milk consumption. The researchers believed they would increase consumption of milk by slowly increasing the proportion of milk mixed with a carnation Pediasure drink. The participant, Angie, was treated in the classroom at her school during lunch time. When Angie consumed 90% or more of the 8 ounce Pediasure/milk ratio mixture during two to three consecutive sessions, the amount of milk was increased by one tablespoon (6.25%). During the intervention, liquid consumption was verbally praised for reinforcement. Prior to the intervention, Angie would only drink milk in an equal proportion to the Pediasure drink, but not by itself. After the intervention, she was drinking 100%

milk, although the researchers noted functional control was not proven because they did not probe a reversal of 100% milk in between sessions. She also continued to drink milk at home after the intervention, indicating strong external validity. The authors of the study demonstrated that fading and reinforcement used in combination rapidly increased Angie's consumption of milk over thirty sessions (Luiselli et al., 2005).

In both of the mentioned studies, liquid consumption was increased and it was reported that the results generalized after the treatments ended. Because the evidence showed measurable gains for both participants receiving the similar interventions, it can be suggested that stimulus fading in combination with differential reinforcement may be useful for increasing food and liquid consumption in other children demonstrating food and liquid refusal. Speech-language pathologists may benefit from being trained in these two interventions to provide pediatric feeding therapy in outpatient, inpatient, and home settings. Future research could measure increased consumption with stimulus fading or differential reinforcement presented in isolation to obtain a better idea of how successful each intervention is by itself.

Differential Reinforcement and Escape Extinction

Anderson and McMillan (2001) investigated the impact of escape extinction and differential reinforcement used in combination to treat food selectivity. The researchers believed that combining these interventions would be effective in increasing food consumption. The single subject was a 5-year-old boy named Rick who had been diagnosed with pervasive developmental

disorders – not otherwise specified (PDD-NOS) as well as severe mental retardation. Prior to intervention, Rick's diet consisted of primarily mashed potatoes, yogurt, and applesauce. The parents used escape extinction in the form of non-removal of the spoon and used verbal praise and a sip of milk (a preferred drink) as reinforcement immediately after an acceptance and swallow of the target food, which was fruit. Initially, Rick had to eat one bite of fruit per meal. Whenever Rick reached a 60% reduction in disruptions for two consecutive meals, the criteria increased by another bite of fruit per meal. Expulsions and self-injurious behaviors decreased significantly as the intervention progressed. A reversal was done mid-intervention when escape extinction and differential reinforcement were not used and Rick only accepted 2% of bites of fruit. During the last phase of treatment, Rick was accepting a mean of 100% bites of fruit. Interruptions did not decrease significantly from baseline, but the number of accepted bites increased (Anderson & McMillan, 2001). The current study suggests that escape extinction and positive reinforcement used for food acceptance is an effective treatment. One concern regarding external validity is if the results of this study can be applied to the rest of the population of children with ASD with food and liquid refusal. Rick is only one child whose results may differ from others.

Differential Reinforcement, Escape Extinction, and Stimulus Fading

Multiple studies have examined the effect of using the three simultaneous interventions of differential reinforcement, escape extinction, and stimulus fading to decrease food refusal in children with autism. In one study done by

Najdowski, Wallace, Reagon, Penrod, Higbee, and Tarbox, (2010), three children who had a limited repertoire of accepted foods as well as inappropriate meal-time behaviors received therapy involving all three intervention techniques. The researchers believed the three interventions would be effective for increasing food consumption. The parents of the children implemented the therapy at home after receiving formal training of how to do the therapy techniques. Training sessions on how to conduct baseline, treatment, and generalization probes were administered during the first ten minutes of the first session of each experimental phase. The parents were told to immediately present a bite of highly preferred food following an accepted bite of non-preferred food. Therapy started with a one-bite minimum for each session and after three consecutive sessions of 1 accepted bite, the minimum increased by 150% of the last bite requirement. The number of minimum required bites was rounded up to the next whole bite when it was not a whole number. Feeding sessions were terminated as soon as the minimum bite requirement was met. The amount of highly preferred items was systematically decreased over time. The results of the study showed that all three interventions used in combination produced favorable results by increasing food consumption by each child (Najdowski et al., 2010). All three children progressed from accepting 0% bites of non-preferred foods during baseline, to accepting 100% bites of non-preferred food during follow-up. The authors of the study also reported that during baseline, the mean percentage of trials with inappropriate meal time behaviors was moderate to high for all children (Najdowski et al., 2010). During intervention, inappropriate mealtime behaviors

decreased to moderate to low for all children. During the follow-up study, the mean percentage of trials with inappropriate mealtime behaviors was in the very low range for all children. (Najdowski et al., 2010).

The increased consumption of food on the part of all three children suggests that the three interventions used in combination are an efficacious approach to decreasing food refusal in children with autism. However, it must be taken into consideration that the children did not have total food refusal, just food selectivity. It should also be remembered that the parents who lead the therapy at home were all college-educated mothers. The results of this study may not generalize to children with more severe food refusal behaviors or parents with different levels of education.

Another study by Freeman and Piazza, 1998 demonstrated the effectiveness of stimulus fading, differential reinforcement, and escape extinction on a 6-year old girl with autism, cerebellar atrophy, mental retardation who exhibited severe food refusal. Rene, the subject of the study, had exhibited severe food refusal and aggression during mealtimes for four years. Rene had previously experienced severe weight loss and dehydration requiring emergency medical attention. Researchers believed using the treatment package of differential reinforcement, escape extinction, and stimulus fading would increase her food consumption (Freeman et al., 1998). Treatment was administered at an inpatient clinic by trained staff. During the experiment, Rene was given a verbal prompt to take a bite every 30 seconds she was not self-feeding. After five seconds of non-compliance, a partial physical prompt was given. If Rene did not

comply after another 5 seconds, a full physical prompt was given and the utensil with food was brought to her lips. Verbal praise was provided when Rene successfully consumed a bite of food. Two to four treatment meals occurred daily during the study. By the end of treatment it was expected that Rene would eat age appropriate portions of fruit, protein, starch, and vegetables. When Rene was 80% compliant for three consecutive sessions, the amount of food presented to her increased by 5%. The trained staff began the treatment by targeting fruit consumption first. After Rene was consuming 50% of age appropriate portions of fruit, proteins, starches and vegetables were added sequentially. Grams of food consumed by Rene remained near zero during baseline. During treatment, however, grams consumed increased steadily and by the end of the twelve weeks of treatment, Rene was consistently consuming 50% of age-appropriate portions of all four food groups. (Freeman et al., 1998). The results of this study reinforce other studies that claim the three interventions used in combination are effective in increasing food consumption in children with autism. Not only did Rene consume larger portion sizes of food, she also consumed an increased variety of foods. However, because the intervention came as a package of differential reinforcement, stimulus fading, and escape extinction, it is difficult to know if one method of treatment caused her to progress more than others. The intervention used was at an inpatient unit with a trained staff and the results may not generalize to Rene's home setting or to other patients receiving similar treatment. The external validity of the study may be compromised because the

results were for one child with severe food refusal and may not generalize to the population.

Sometimes stimulus fading is used to slowly increase the texture of foods consumed instead of amount or category of food consumed. In a study done by Shore and Babbitt, 1998, texture fading was used in combination with escape extinction and differential reinforcement to slowly and safely increase consumption of higher textured foods in four children. One 3-year-old boy named Ray was diagnosed with bronchopulmonary dysplasia, blindness, and failure to thrive. Another child, Julia, was a 2-year 10-month old girl who exhibited food refusal, carried the diagnoses of severe GERD, renal tubular acidosis, solitary kidney and sensorineural hearing loss. At the point of admission, Julia received all feedings by a gastrostomy tube. The third child, Trevor, was a 3-year 8-month-oldboy who had severe food selectivity by type and texture. His diagnoses included mild developmental delays in speech and language and a history of seizures. The fourth child, Andy, was a 5-year 2-month old boy exhibiting food refusal and food selectivity by texture had the diagnoses of craniosynostosis, severe mental retardation, hypotonia and oral motor dysfunction. The researchers believed that the treatment package of differential reinforcement, escape extinction, and stimulus fading would be the best approach to address the feeding habits of these children (Shore et al., 1998).

Each child was fed three times a day at an inpatient clinic by one of four trained professionals (Shore et al., 1998). Verbal praise was given for accepting bites or drinks and 15 seconds of toy play and praise was given for swallowing

bites or drinks. Escape extinction was used by holding the utensil to the mouth until an opportunity to deposit the food occurred and placing any expelled food back into the mouth until swallowed. When the child was consuming the amount of food recommended by the nutritionist, the professionals probed higher textured foods to determine the next texture to fade into. Success with a specific texture was defined as acceptances and swallows above 80%. Expulsions and gags had to be below 20%. If the next texture did not meet that criteria, the new texture was faded in by 25% next texture/ 75% previously successful texture, 50% next texture/50% previously successful texture, 75% next texture/25% previously successful texture, until 100% of the next texture could be consumed. When the texture was successfully consumed over three consecutive sessions, the next texture up was probed. The textures included pureed texture (e.g. apple sauce), junior texture (e.g. yogurt, cottage cheese), ground texture (e.g. ground meats), and chopped fine texture (finely chopped meat, chopped cooked vegetables). Results for Trevor showed that acceptances and swallows were high for the beginning pureed texture.

Swallows decreased significantly and expulsions increased when a new texture was introduced (Shore et al., 1998). After texture fading, Trevor was able to advance to his targeted junior texture with low expulsions and high acceptances and swallows. Ray also achieved his targeted food texture and volume. Julia progressed from junior textured food with high acceptances and swallows to ground texture, however, her grams consumed across meals was variable. Andy began at pureed food with acceptances and swallows being high

and consistent. He progressed from junior texture, to ground texture, to chopped fine texture where he stayed. At the end of treatment, acceptances and swallows were high but variable, gags were at 0%, and expulsions were variable. For Andy, the number of grams consumed throughout treatment remained high with his target volume being consumed during most of his meals.

The results of the aforementioned studies which combined differential reinforcement, escape extinction, as well as stimulus fading in a treatment package suggest that the three techniques used simultaneously are effective in establishing consumption of food in children exhibiting food refusal. (Shore et al., 1998; Freeman et al., 1998; Najdowski et al., 2010). In all clinical cases, the amount, texture or both amount and texture of food was increased throughout therapy for each child. There were however, differences in how rapidly food consumption increased for each child. It is to be expected that the results would not be identical for each child considering different medical diagnoses, histories, and other compounding factors that make each child different. The most obvious limitation to these studies is that the experimental design does not allow each treatment technique to be examined in isolation. Because of this, it is unknown if each technique was equally useful in increasing food consumption. However, in comparison to other studies only utilizing two of the three techniques, it seems the treatment package of all three may provide the most robust intervention for children with autism who exhibit food refusal.

Parent-Implemented Interventions

Although the field of speech-language pathology seems to widely accept

the use of escape extinction, differential reinforcement, and stimulus fading in the clinical setting, it has been questioned if the treatment procedures can be used at home by a family caregiver. Training caregivers of children with autism to be the change-agents for food refusal and feeding time difficulties could be extremely beneficial for families who want to continue the treatment at home. Not only would home-based treatment be in a more natural environment for the child, but it would decrease the amount of time and money spent in a clinical setting. In addition, because children are expected to continue to eat food in home settings post-treatment, studies conducted in the home environment are needed.

In the previously mentioned study by Najdowski, Wallace, Reagon, Penrod, Higbee, and Tarbox, 2010, mothers were trained to implement differential reinforcement, escape extinction, and demand fading for the treatment of their children's food refusal. Three mother-child pairs were included in the study. Annabelle, the first child mentioned in the study, was a 2-year-old girl with autism who ate approximately ten foods prior to intervention. Colin, the second child mentioned in the study, was a 4-year-old boy with autism who ate approximately twelve foods consisting mainly of starches and fruits prior to intervention. Kari, the third child in the study, was a 4-year-old typically developing girl who ate approximately only nine foods. All mothers had at least 16 years of formal education. Feeding sessions that were studied occurred once per day. Mothers were instructed to make sure the child had not eaten for three to four hours prior to the session. The primary investigators of the study were present for two meals per week. One unsupervised meal per week was

videotaped and coded for procedural integrity and accuracy of data collection. During mealtimes, each trial was scored by bite accepted, swallowed, rejected, as well as inappropriate meal time behaviors. The mothers then implemented the treatment package of escape extinction (non-removal of the spoon), differential reinforcement (highly preferred foods delivered within 5 seconds of an acceptance or swallow), and demand fading (a three-step prompting procedure of vocal, gestural, followed by physical prompts). (Najdowski et al. (2010). Each mother was taught to collect data and compare it to two trained independent observers. Intra-observer agreement was 99.8% for swallows, 97.6% for inappropriate mealtime behaviors (Najdowski et al. 2010). The minimum required was 90% agreement to discontinue the training. Parents were also trained on how to conduct baseline assessments, treatment, generalization probes, and follow up during the first ten minutes of each experimental phase. Mothers were considered trained when they had at least 90% accuracy for two consecutive sessions on implementing procedures. Results of training the mothers showed that the mothers performed preference assessments with 100% procedural integrity. Najdowski and colleagues reported that, “All three mothers demonstrated a mean of 99% procedural integrity across all experimental phases.” (p.102). None of the mother needed additional training sessions. In addition to the mothers being able to maintain the procedural integrity of the feeding intervention, all three children increased their food consumption by the end of the study. (Najdowski, Wallace, Reagon, Penrod, Higbee, Tarbox, 2010).

The results of this study also give promise to parent-delivered home

based treatments for food selectivity and food refusal in children with autism. One of the limitations of the study is the population of children and mothers used. All of the mothers of this study were formally educated and the children did not exhibit severe food refusal. It would be important to study the effects of home-based treatments with more severe food refusal cases as well as with parents who are less educated or with fathers as well as mothers.

Another study by Anderson, and McMillan, 2001 examined parental use of escape extinction and differential reinforcement. The researchers used a video monitoring method to assess treatment integrity and to provide valuable feedback to parents leading the intervention. The study was done on a single 5-year-old boy named Rick who had been diagnosed with pervasive developmental disorder and severe mental retardation. The goal was to have Rick consuming more fruit, which was a non-preferred food item at the beginning of the study. At least one meal each day was videotaped by the parents and scored weekly by trained observers. Frequency data was collected on child as well as parent behaviors. Parent behaviors such as bites offered, reinforcer delivery, and removal of the spoon (escape) were recorded (Anderson et al., 2001). Frequency data was taken on acceptances, expulsions, self-injurious behavior, and interruptions by Rick. Parents were trained to implement escape extinction and differential reinforcement through verbal and written instruction, modeling, role-playing, videotape review, and weekly feedback during home visits (Anderson et al., 2001). Feedback was provided for each meal for the first three meals and approximately once a week after that. The frequency data taken on Rick was

compared with a second observer who collected data 31% of the sessions. "The exact occurrence agreement coefficient was 86% for reinforcer delivery, 95% for allowing escape, and 93% for bites offered. Agreement coefficients for target child behaviors were 90% of acceptance, 94% for expulsions, and 72% for interruption. The mean agreement score for SIB was 94%" (Anderson et al., 2001, p.512). The high levels of inter-observer agreement add to the integrity of this research design (Anderson et al., 2001). The results of the intervention increased Rick's food consumption. At baseline, he rarely consumed fruit, interrupted over half of fruit bites presented, and his parents were allowing him to escape 83% of bites of fruit offered. In the last phase of treatment, Rich was accepting a mean of 99% of bites of preferred food and 100% bites of fruit. Interruptions decreased to 17% of preferred foods and 38% for fruit (Anderson et al., 2001). Expulsions and SIB remained low during the final phase. Data taken on the parents behaviors showed they were about to implement the intervention with high accuracy. They delivered a reinforcer following a bite 95% of the time. Escape was allowed on only 1% of bites of preferred food and 3% of bites of fruit. Rick ended up consuming age appropriate servings of fruit by the end of the intervention. (Anderson et al., 2001).

The results of this study also suggest that parents can be change agents in their child's treatment in a natural environment. Rick's parents were able to accurately implement the intervention and make clinically significant changes in their child's food consumption. The external validity of this study may be compromised depending on different factors. It would be important to repeat this

study with other parents and other children with diagnoses of autism to assess how well treatment can be carried out in the home setting by caregivers.

Another study by McCartney, Anderson and English, 2005, examined the effect of brief clinic-based training ton the ability of caregivers to implement escape extinction and differential reinforcement. Three of the four children included in the study had a diagnosis of autism and one was considered typically developing. The children's intervention included four treatment phases: parent-fed baseline probes, therapist sessions in the clinic, caregiver sessions in the clinic, and caregiver sessions at home. When conducting sessions at the clinic, caregivers delivered attention following the majority of bites accepted for the first target food. (79%, 82%, 87%, and 97% of bites accepted for Alan, Kurt, Matt, and Tim, respectively). (McCartney et al., 2005). Percentages of bites accepted followed by attention increased with the second target food and remained high when the intervention was moved to the home environment. Post-treatment, all of the children were eating more non-preferred food items. All of the caregivers also reported that their children were consuming foods that were not targeted during treatment, suggesting that generalization across foods had occurred.

Conclusion

The various studies presented have shown that food and liquid refusal and inappropriate meal time behaviors are a concerning and common problem among children who have the diagnoses of autism spectrum disorder. Differential reinforcement, which provides strong reinforcement for highly preferred behaviors and less reinforcement for less desired behaviors is one of

the methods used to treat food and liquid refusal. However, this technique used alone may not be sufficient in treating food and liquid refusal in children with autism. Non-removal of the spoon, the commonly used form of escape extinction, is another technique used to treat food and liquid refusal. It seems that this technique helps to make gains in treatment progress, but also does not stand alone as well as when combined with other techniques. Stimulus fading, which commonly slow increases the texture, type, or amount of food presented has also been successfully used in treating food and liquid refusal. Research has shown that these techniques seem the most effective when used in combination with each other. Some studies reflect on the efficacy of two of the three combinations used together. Other studies include the whole treatment package. Although each intervention for children with autism would ideally be tailored to the needs and individual circumstances involved in the treatment, it appears that differential reinforcement, escape extinction, and stimulus fading can generally be considered the most robust and effective intervention for food and liquid refusal. In using all three techniques, the child's desired behaviors are being reinforced, the attempts of escape from the situation are being put on extinction, and the stimuli is being presented in a way that's not overwhelming to the child.

Although the treatment package has been accepted as effective in treating food and liquid refusal in children with autism, it was also important to consider the child's eating behaviors from a long-term perspective. The other studies mentioned were researching the ability of parents to implement the interventions

at home. Not only would parent-implemented interventions be delivered in a more natural and comfortable environment for the child, but the time and money costs could be decreased. Allowing parents to serve as the change-agents for their child's mealtime difficulties potentially saves them visits from the clinic and hospital. The major concern for parent-implemented interventions was the accuracy at which parents would be able to implement the methods of the design. Not being formally educated about treatment of feeding disorders raised the possibility the parents would not understand how to conduct the treatment. In addition, escape extinction can initially cause an increase in undesired behaviors in the child (screaming, crying, self-injurious behavior, aggression etc), and could potentially make it harder for parents to adhere to the defined protocol. Verbal and written instruction, video feedback, roleplaying were some of the methods of training the parents. As seen in the mentioned studies, parents were able to accurately implement the treatment packages and cause increases in their child's food or liquid consumption. Although in these studies, parents did serve as effective change-agents, more research is needed to address if other parents with different levels of education, different socioeconomic statuses, and different severity levels of the child's autism and food refusal has an impact on the ability of the intervention package to be implemented at home. Recommendations for future research include more studies that examine the caregiver's ability to implement interventions in the natural environment, different techniques of transferring stimulus control to caregivers in natural environments, as well as maintenance of gains in the natural environments. In addition, studies that

examine the incidence, health effects, and inappropriate meal time behaviors of children with ASD who exhibit food refusal, particularly with larger sample sizes need to be conducted.

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