Increasing Food Acceptance in the School Setting for Children with Autism Spectrum Disorder Using High Probability Requests Sequences

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Abstract

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Behavioral feeding difficulties occur at a high rate in children with autism spectrum disorders (ASD) and can have a serious impact on their overall health and development. Although there are a number of studies demonstrating effective strategies for addressing behavioral feeding difficulties in children with ASD, the majority of them have been conducted in clinical settings. High probability (high-p) request sequences have been used as an antecedent intervention to increase compliance, appropriate behavior, social interactions, decrease stereotypy, self injurious behavior, increase compliance to academic tasks, increase communication skills, and in interventions to increase food acceptance and consumption. This evidence-based intervention has been demonstrated to be effective in both clinical and applied (e.g., school) settings. The current study investigated the efficacy of high probability request sequences, an easy to implement, school-based behavioral feeding treatment. In the study food related and non-food related high probability requests sequences were compared for efficacy. The participants in the study were three children with ASD that had parent and teacher reported feeding difficulties. Results suggested that school-based high probability response sequences were extremely effective for 2 of the 3 participants. Consumers were very positive about the intervention.

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DEDICATION

This paper is dedicated to very special people.

First, to Greg, the first person to encourage me to obtain my PhD in Special Education. Greg, you left this earth too soon, before you could see me complete this degree, but I am grateful everyday for your belief in me and for encouraging me to follow my passion to work with children and families.

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To all the young children I have worked with, your hard work and progress reminded me everyday why I am so blessed to work with children with ASD and their families.

Chapter 1

INTRODUCTION

Learning to feed oneself is an important developmental milestone. It is surprising to many people, however, that feeding difficulties are one of the most common issues affecting children. It is estimated 25% of infants and children who are typically developing exhibit some type of feeding difficulties and 3%-10% of children encounter severe enough problem in this area to seek clinical attention (Babbitt, Hoch, & Coe, 1994; Lindberg, Bohlin, & Hagekull, 1991; Reau, Senturia, Lebailly, & Christoffel, 1996; Mayes, & Volkmar, 1993). Feeding difficulties are especially common is children with developmental disabilities such as Autism Spectrum Disorder (ASD) where the prevalence of feeding difficulties has been estimated to be up to 80% (Kerwin, 1999; Kodak & Piazza, 2008). In terms of variety of food consumed, 60% of children with ASD are reported to eat less than 20 different foods, and up to 50% may have vitamin and nutrient deficiencies (Cornish, 1998).

The feeding difficulties exhibited by children can be categorized as medical, behavioral, or a combination of medical and behavioral issues (Budd et al., 1992). Some medical reasons for feeding difficulties include trouble swallowing, acid reflux, prematurity, cystic fibrosis, food allergies, stomach and intestinal sensitivities, and cleft palates (Lincheid, 2006). With cystic fibrosis there can be difficulties with swallowing which can lead to feeding issues or contribute to a child becoming food selective. In some cases, as with acid reflux, eating certain kinds of food can be painful for the child, with heartburn, coughing, or vomiting occurring. Food allergies are also considered a medical reason for having a feeding difficulty; having allergies to nuts, eggs, and/ or milk products can limit the variety of food eaten by a child and may lead to future feeding difficulties. When children are born with a cleft palate they may not learn to suck

properly in infancy and may also have to develop their oral motor skills before they are even able to consume food orally, both factors can lead to future feeding difficulties. Although feeding difficulties in children without ASD can have a medical or organic cause that must be addressed (e.g., cleft palate repair), children demonstrating these types of difficulties usually receive behavioral feeding intervention as well to address coexistent behavioral issues that have developed as secondary disabilities (Shore & Piazza, 1997). Schwarz (2003) stated, however that most feeding difficulties in children with ASD can be categorized as behavioral feeding difficulties or sensory based feeding difficulties. Behavioral feeding difficulties include food refusal, limited food acceptance, gagging, emesis, expulsion of food, and choking has no medical basis (Ledford & Gast, 2006). Sensory based feeding difficulties include aversion to textures of specific foods (Schwarz).

Like other types of behavior, behavioral feeding difficulties are maintained by their consequences (Shore & Piazza, 1997). Sometimes feeding difficulties are maintained with positive reinforcement (the child is given attention when refusing to eat and increases the probability of future food refusal). With other children, the behavior is maintained by negative reinforcement. The child learns they can escape the feeding situation or eating a particular food by exhibiting certain behavior and then have the food removed or the feeding situation is terminated. In other words, an aversive stimulus (i.e., the food) is removed, increasing the probability of the behavior (i.e., food refusal) happening again. Examples of behavioral feeding difficulties in the literature illustrate a majority of difficulties (partial or total food refusal, or food selectivity) occur when children engage in refusal behaviors (e.g., screaming, crying, hitting, throwing the food, removing the food from the plate, turning away) and the food is removed

(Woods, Borrero, Laud, & Borrero, 2010). In many cases, severe feeding difficulties and feeding disorders continue and get worse over a period of time (Lindberg, et al., 1991).

Feeding difficulties range from mild to severe. A child is identified as having a feeding disorder when he/she fails to consume an adequate volume or variety of food in order to maintain weight and/or grow, requiring clinic and/or medical attention (Patel, Piazza, Martinez, Volkert, & Santana, 2002). Some children may refuse to eat solid foods and are required to obtain nutrients from bottle feedings or feeding tubes. Children with ASD, may be picky eaters (food selective), only eating certain types of food, exhibiting preference by color, type (e.g., carbohydrates, sweets, dairy), texture (e.g., liquid or solid), or by the way the food is packaged (Field, Garland, & Williams, 2003). Feeding difficulties, whether the etiology is medical, behavioral, or a combination of medical and behavioral, or the whether the child is a picky eater or has a diagnosed feeding disorder, can lead to health issues such as improper bone development, poor nutrition, vitamins A and D deficiencies, iron deficiencies, and deficiencies in fat (Cornish, 1998; Hediger et al., 2008; Raiten & Massaro, 1986).

The USDA (2010) recommends young children should eat a variety of different foods. The exact amount eaten by a 3-year old child is dependent on age, size, and activity level. Intake of 1000-1400 calories per day is recommended for children two to three years of age. The recommended amount of whole grains is four to five ounces per day, one and a half cups of vegetables, one cup of fruit, two cups dairy and 3-4 oz of meat (USDA, 2010). Neither the USDA or the research defines the average number of different foods eaten per day by a three year old (with or without ASD), but states that children should be offered a variety of foods from each food group, with three meals, and two snacks per day, and that parents should model “good” eating behavior (National Center for Education in Maternal and Child Health, 2012).

A study by Nadon, Feldman, Dunn, and Gisel (2011) compares the eating habits of typically developing children and children with ASD. Children with ASD were found to be two times more likely than their typically developing peers to present with a feeding difficulty. The most common feeding difficulties reported were with variety of types of food eaten and willingness to try new foods (Nadon et al., 2011). A decline in food intake was most prominent in three-year old children with ASD (this was a multi-aged participant study). Schreck, Williams, and Smith (2004) also found that children diagnosed with ASD refused more foods, demonstrated idiosyncratic meal related behavior (e.g., required more specific utensils to eat, required food presented in more specific ways), were more likely to consume foods at a lower texture, and ate a narrower range of foods than typically developing children.

Traditional Feeding Treatment Methods

A majority of the research on behavioral feeding treatment has been conducted in clinical settings. Common procedures used in the clinic setting are escape extinction and reinforcement. Through a multitude of research studies, escape extinction and differential reinforcement have been shown to be effective for treating feeding difficulties (Borrero, Woods, Borrero, Masler, & Lesser, 2010) and are commonly used procedures. The research that has examined the use of functional analyses (FAs) to determine the function of mealtime behaviors (including picky eating) have determined that most inappropriate mealtime behaviors are maintained by negative reinforcement (escape of the mealtime or the food) and that problem behaviors during mealtime are often maintained by positive reinforcement (Girolami & Scotti, 2001; Najdowski et al., 2008; Piazza et al., 2003; Riordan et al., 1984).

Research has been conducted using other techniques, but many studies show that behavioral feeding treatments can be more effective when escape extinction and reinforcement

are used together as part of a comprehensive or multi-component intervention (Laud, Giroami, Boscoe, & Gulotta, 2009). Most often when treating children with feeding difficulties, escape extinction is used in conjunction with another procedure. Escape extinction has been shown in the current research to be highly effective procedures in reducing refusal behaviors and increasing food consumption, especially when combined with reinforcement (Ahearn, Kerwin, Eicher, Shantz, & Swearingin, 1996; Hoch, Babbitt, Coe, Krell, & Hackbert, 1994; Piazza, Patel, Gulotta, Sevin, & Layer, 2003).

Escape extinction (here after referred to a escape prevention or escape prevention procedures) is used to reduce escape maintained behavior. Many times when a child has a feeding difficulty, it has been negatively reinforced (e.g. feeder presents bite to the child and the child cries, screams, turns head, or hits, then the feeder removes the bite; functionally reinforcing the food refusal by removing the aversive stimulus, the food), the child has been allowed to escape the feeding situation. Escape prevention procedures prevent the child from escaping the feeding situation (Piazza et al., 2003), generally by non-removal of the eating utensil. In other words, the bite of food is not removed, even if the child is crying or attempting to swat the food away. Escape prevention procedures can also include physical guidance by the therapist, where the therapist physically guides the child's hand to his/her mouth and helps them open their mouth and take the bite food, re-presenting of the food until the child accepts the bite, or continues with the feeding session until the child takes a bite (Ledford & Gast, 2008). During escape prevention procedures, the child's hands may be blocked by a second professional in order to keep the child from batting the food away or trying to take the food out of his or her mouth. Refusal behaviors, such as crying, screaming, as well as appropriate communication behavior to try and escape

eating, are ignored in these sessions. Thus, with escape prevention the child learns that inappropriate mealtime behavior no longer allows them to avoid the food.

Reinforcement occurs when a stimulus (attention, praise, or preferred items) is delivered contingent upon a behavior that increases the future probability of that behavior occurring (Cooper, Heron, & Heward, 2007). Reinforcement in behavioral feeding treatment occurs when access to a social attention or a preferred item (e.g., toys, music or preferred food) follows a behavior such as acceptance of a bite or consumption (Hoch et al., 1994; Piazza, et al., 2003; Levin & Carr, 2001). Reinforcement is not just the presentation of a preferred item, but must increase the probability that the child will eat the food in the future as a result of the contingent presentation of a specific stimulus. Differential reinforcement of an alternative behavior (DRA) is a common type of reinforcement used in behavioral feeding treatment. DRA involves delivering a reinforcer (attention, or a tangible item) following the occurrence of a desirable alternative behavior to the problem behavior (Sharp, Jaquess, Morton, & Miles, 2011). DRA most commonly occurs in feeding treatment when a child accepts or consumes a bite of food and is given access to the reinforcer.

Sometime referred to as non-contingent reinforcement in a majority of the feeding treatment literature, but more appropriately called non-contingent attention (NCA), is also used in the treatment of feeding difficulties (Sharp et al., 2011). With NCA, a child is given access to both social attention and preferred tangible objects throughout the session (meal) non-contingent on his/her feeding behavior. Gradually increasing texture, variety of the food presented, or the amount of food presented (stimulus fading) (Rivas, Piazza, Patel, and Bachmeyer, 2010) , high probability sequences (Patel et al., 2007), simultaneous and sequential presentation of food (Piazza et al., 2002), and restricting access to preferred foods prior to feeding treatment session

(appetite manipulation) have also been used to treat children with feeding difficulties (Levin & Carr, 2001).

Previous research has shown clinic-based behavioral feeding treatment to be effective for children with disabilities who demonstrate feeding difficulties, including children with ASD (Kerwin, 1999; Sharp et al., 2011). Piazza, Roane, and Kadey (2009) stated that studies taking place in the clinic setting, have shown combining the use of reinforcement, such as DRA, NCA, and escape prevention procedures in treatments for children with feeding difficulties has a greater effect in increasing acceptance than reinforcement used alone. These interventions also have been shown to have some success in helping children demonstrate generalized improvement in food consumption across time and setting.

Feeding Difficulties and ASD

The current number of children diagnosed with an autism spectrum disorder (ASD) is approximately one in 88 children (CDC, 2012) and up to 80% of children with ASD are described as food selective or picky eaters (Kodak & Piazza, 2008). Some of the reasons suggested for the high rate of feeding difficulties in children with ASD may be due to impulsivity, sensory sensitivities (aversions to texture of certain foods), restricted and repetitive patterns of behavior including perseveration and adherence to familiar routines, and impairments in social interactions, such as lack in the sharing in the interests and enjoyment of others (Ahearn, Castine, Nault, and Green, 2001; Cumine, Leach, & Stevenson, 2000; Schwarz 2003). Schwarz (2003) states most of the feeding difficulties in children with autism can be categorized as behavioral feeding difficulties and sensory-based feeding difficulties. Assessment and treatment of feeding difficulties at a young age should be a priority due to future health risks (Ledford &

Gast, 2008) and the potential of children developing even more rigidity around eating routines and rituals as they get older.

Often when a child with ASD has a feeding difficulty it has been negatively reinforced, the child has previously been allowed to escape the feeding situation or the particular food at mealtime (J. Dawson, personal communication, 2009). Communication difficulties are also suggested to be a contributor to the maintenance of problem behaviors at mealtime (Shaw, Garcia, Thorn, Farley, & Flanagan, 2003). The most common feeding difficulties in children with ASD are food selectivity (picky eating) and low acceptance rates (Sharp et al., 2011). Food selectivity by food group (e.g. carbohydrates) is shown to be an increasing trend in children with ASD (Schreck, Williams, & Smith, 2004).

Feeding treatments in ASD. The most common procedures used to treat feeding difficulties in children with ASD are similar to behavioral feeding treatment procedures used with other children. As with other populations of children with feeding difficulties, multiple behavioral components are used in treatment for feeding difficulties in children with autism (Ahearn et al., 2001; Levin & Carr, 2001; Piazza et al., 2002). In the following section I will review a number of intervention strategies that have been shown to be effective in addressing feeding difficulties in children with ASD.

Differential reinforcement of an alternative behavior (DRA) is commonly used in behavioral feeding treatment and is often used in conjunction with other procedures such as escape prevention procedures (Kern & Marder, 1996; Levin & Carr, 2001; Piazza et al, 2002; Sharp et al., 2011). There have also been different procedures used when treating children with ASD for feeding issues. These include simultaneous and sequential presentation of food, appetite manipulation, and stimulus fading (Kern & Marder, 1996; Levin & Carr, 2001; Piazza et al.,

2002). Appetite manipulation was defined as restricting access to preferred foods prior to a feeding treatment session (Levin & Carr, 2001). Stimulus fading involves manipulations of antecedent conditions including variety fading (gradually increasing exposure to the non-preferred foods or feeding demands), texture fading (presenting non-preferred foods in a lower texture than preferred foods and gradually increasing the texture), and bolus fading (gradually increasing the amount of food on the spoon); stimulus fading is used to shape more appropriate feeding behaviors while gradually increasing exposure to the former aversive stimuli, the non-preferred food (Sharp et al.).

Levin and Carr (2001) examined the effectiveness of appetite manipulation, defined as restricting access to preferred foods prior to feeding treatment session, and DRA (reinforcing food acceptance) to increase food acceptance in children with ASD. The results indicated that when implemented alone, neither DRA nor appetite manipulation increased food acceptance for any of the children but, when these procedures were implemented together there was an increase in food acceptance. Ahearn et al. (2001) used escape prevention and reinforcement to increase food acceptance in one child with an autism spectrum disorder. The results showed an increase in food acceptance and maintained a 100% level of food acceptance in follow up sessions (Ahearn et al.). Piazza et al. (2002) examined the effectiveness of simultaneous and sequential presentation of food and appetite manipulation, and reinforcement to increase food acceptance and consumption in three children with an autism spectrum disorder. Simultaneous presentation of food consisted of presented the non-preferred food and the preferred food at the same time; in sequential presentation the non-preferred food was present first and then dependent upon acceptance of that food, the preferred bite of food was presented One child increased bite consumption with the use of simultaneous and sequential presentation of food, the second child

increased consumption in the simultaneous presentation condition only, and acceptance increased for the third child only when escape prevention was used (Piazza et al.). Rivas et al., (2010) used stimulus fading and stimulus fading with escape prevention and reinforcement to increase food acceptance and decrease inappropriate mealtime behaviors. Stimulus fading consisted of gradually decreasing the distance of the spoon to the participant's mouth. The results show that the use of escape prevention and stimulus fading together were more effective than stimulus fading alone in decreasing inappropriate mealtime behaviors and increasing food acceptance.

Another intervention that has been effective in increasing food acceptance for some children with ASD and feeding difficulties is high probability request sequences. Patel and colleagues (2007) used high-p request sequence without escape prevention to increase compliance to feeding demands in a child diagnosed with an autism spectrum disorder. This study was conducted in a clinic setting. In the high-p request sequence intervention the child was presented with three tasks and/or foods that had a high likelihood of being accepted, and then the low probability requests (non-preferred food) is presented. The child in the study did not exhibit any active food refusal (problem behaviors) during the meal; the child's food refusal was passive (non-compliance) only. The results suggest that use of the high-p request sequence was effective in increasing and maintaining a high level of acceptance and consumption with new foods for a child with passive food refusal (Patel et al., 2007).

Dawson et al. (2003) used a high-p request sequence in combination with escape prevention in the treatment of total food refusal. During the high-p request sequence only phase, three high-p requests were presented in random order (e.g., " touch blue," "clap your hands"), then the instruction to take a bite was given (low-p request). In the escape prevention phase, if

the child exhibited any refusal behaviors (e.g., turning her head, spitting the food out) she was not allowed to escape the bite; the bite was held to her mouth until she accepted the food. The participant had been allowed to escape the bite when exhibiting refusal behaviors during the high-p phase. During the escape prevention and high-p phase, the participant was presented with three high-p requests and was not allowed to escape the bite of food if refusal behaviors were exhibited. The results showed that food acceptance increased to 100% when escape prevention procedure were implemented with or without the use of a high-p request sequence (Dawson et al.). The use of the high-p request sequence alone was not effective in increasing food acceptance for the one participant.

Patel et al., (2006) investigated the effects of escape prevention procedures and a high-p request sequence on food acceptance and inappropriate mealtime behavior for three children with feeding difficulties in a clinic setting. Instead of using simple fine motor requests such as "clap your hands," food related requests such as, "open your mouth," "take a bite", or "take a drink" of a preferred item, were used. An empty utensil or a different cup was used during the high-p requests. The difference between high-p and low-p requests was the presentation of food on the utensil or the use of a different feeding utensil, with the low-p request (Patel et al.) Verbal praise was given when compliance to the high-p request was demonstrated within five seconds. Escape prevention procedures were applied across phases for the participants. The result show acceptance increased for all participants. However, acceptance was the highest when the escape prevention procedures were used in conjunction with high-p request sequence (Patel et al.).

Meier et al., (2012) used only a high-p request sequence to increase food acceptance in the home for one child with ASD. The parents wanted the participant to consume more fruits and vegetables. The participant was a three-year old girl that did not exhibit any problem behaviors

during mealtimes. During treatment the therapist presented three bites of preferred food within three to five seconds of each other and then the non- preferred food was presented; upon acceptance of preferred and non-preferred foods brief verbal praise was given. The same preferred food was presented three times in row during the high-p request sequence intervention. The results of the study show the use of a high-p request sequence were effective in increasing food acceptance in the home for one child with ASD (Meier et al.).

In the study by Penrod et al., (2012) high-p request sequences were combined with low probability demand fading to treat feeding difficulties in two boys with autism that exhibited active food refusal (problem behaviors during mealtimes) in a pediatric behavior research laboratory. With the low probability demand fading, the difficulty of the low-p requests were gradually increased; for example, from an initial request of holding the food to the mouth to a more difficult request of putting the food on the tongue. No data were collected on the frequency of the problem behaviors during mealtimes. The results showed an increase in food consumption for both participants across settings and people; however, it is not clear which procedures were responsible for the increase in compliance and food consumption since demand fading was used in conjunction with high-p requests (Penrod et al., 2012).

In summary, the research has shown the use of a high-p request sequence without escape prevention procedures may be effective in increasing food acceptance for some of the children with feeding difficulties (e.g., Meier et al., 2012; Patel et al., 2007). The results suggest using high-p request sequences are more effective for children that do not exhibit severe problem behaviors during mealtime. The use of a high-p request sequence also appears to be more effective in increasing acceptance when preferred foods or food related tasks are given as the high-p requests, before the request to eat the non-preferred food is given or the child is asked to

take a bite (low-p requests) (Meier et al.; Patel et al.). Food related requests include using bites of preferred foods or the use of an empty utensil, as long as the child shows a high level of compliance when asked to complete these tasks; ex: the request of "take a bite" is given and the child take a bite of the preferred food or puts the utensil to his or her mouth 80- 100% of opportunities. Food related requests might be more effective than non-food related requests when used to treat feeding difficulties, however no known research has compared the efficacy of food-related tasks versus non-food related task in increasing compliance and food acceptance.

High-p requests sequences may be more effective for passive feeding difficulties because the children in the studies tend to exhibit less severe feeding difficulties and less problem behaviors. Problem behaviors may interfere or compete with compliance that is maintained by negative reinforcement in the form of escape, especially if the escape contingencies remain in place (Mace et. al., 1988; Zarcone et al., 1994). It is also possible that problem behaviors may interrupt the momentum of the behavior or decrease compliance to high-p requests; it may be difficult for the child to comply to a request and engage in problem behavior at the same time.

High Probability Request Sequences

Nevin, Mendell, and Atak (1983) suggested that behavior has momentum, similar to Newton's first law of motion. The theory states that behavior is thought to have momentum and once engaged in behavior or completing high-p requests, which result in a higher density of reinforcement, momentum of compliance is established and continues when a low-p request is given (Zarcone et al., 1994). The behavioral momentum analogy has been used to develop the antecedent approach termed high probability request sequence, pre task requesting, interspersed request, or behavioral momentum in the research literature. High-p request sequences include a set of instructions, usually three to five, for which compliance occurs in at least 80-100% of

opportunities presented, followed by a request where compliance is less likely or a low probability of occurring (Davis, Brady, Williams, & Hamilton, 1992).

Research has shown the effectiveness of using a high-p request sequence to influence the occurrence of a low probability behavior. The strategy has been implemented to increase compliance to a general request (e.g., "sit down"), to specific requests including, taking medicine (McComas, Wacker & Cooper, 1998), completion of academic tasks (Lee & Laspe, 2003), increase social interactions (Davis, Brady, Hamilton, McEvoy, & Williams, 1994), increase communication of signed words (Sanchez-Fort, Brady & Davis, 1995), compliance during transitions (Davis, Reichle, & Southard, 2000) for decreasing self-injurious and/or aggressive behavior (Horner, Day, Sprague, O'Brien, & Heathfield, 1991), and to increase food acceptance and consumption (Patel et al., 2007). Teachers and parents have also reported on the efficacy of the strategy and the likability of using high-p request sequences (Ardoin, Martens &Wolfe, 1999; Davis et al., 2000; Ducharme & Worling, 1994; Killu, Sainato, Davis, Ospelt, & Paul, 1998). However, some studies also reported that the use of a high-p request sequence did not produce compliance at high levels without the use of addition intervention procedures, such as the use of escape prevention procedures (Dawson et al., 2003; Zarcone, Iwata, Mazaleski, & Smith, 1994).

Two studies by Horner, et al., (1991) used a high-p request sequence (termed interspersed requests) to reduce aggression and self-injury in three older children with disabilities. Functional analysis assessments were conducted during the first four phases of study one and the results showed that self-injury and aggression were maintained by negative reinforcement (Horner et al.). During the high-p request sequence and hard task phase, participants were asked to complete difficult tasks. If any problem behavior occurred during the request of completion for difficult task, then three to five simple requests were made (Horner et al.). Upon successful completion of

the simple tasks, praise was given to the participants. Study Two was similar to Study One; using high-p request sequences to decrease aggression and self-injurious behavior when difficult tasks were presented. Results from both studies suggest that the use of the high-p requests decreased aggression and self-injurious behavior and increase compliance to complete a difficult task in all three participants (Horner et al.).

Davis et al., (1994) examined the effects of a high-p request sequence to increase and generalize social interactions in three young boys with disabilities. The sessions took place during a regular playtime with typically developing peers. Five different phases were included in the study; collection of data on normative initiations, peer training, baseline, high-p request sequence intervention, prompt removal, and generalization. During the high-p request intervention phase, three to five high-p requests were given within 10 seconds of each other, followed by praise upon successful completion, and then the low-probability (social initiation to a trained/familiar peer) request was given (Davis et al.). Davis also examined the effects of using a high-p request sequence to initiate to untrained and unfamiliar typically developing peers. The results demonstrated that a high-p request sequence intervention was effective in increasing social initiations to a trained peer and generalizing to an unfamiliar peer for all three participants (Davis et al.).

A high-p request sequence intervention has also been used to increase compliance with medical procedures. In the study by McComas, Wacker, and Cooper (1998) a treatment package using high-p requests with escape prevention procedures was compared to a treatment package using reinforcement and escape prevention procedures; high-p requests were not used in isolation. The child's mother conducted all of the sessions in the hospital with the help of the therapist. The

results of the study showed that compliance was higher when the high-p request and escape prevention procedures were used (McComas, et al., 1998).

Davis and Reichle (1996) examined the effects of variant and invariant high-p request sequences and the effects on increasing appropriate social behaviors in four children with disabilities. Variant high-p request can be defined as having a pool of high-p request for the child, thus being able to use the requests in random order and invariant high-p request sequence can be defined as using the same high-p requests in the same order for the duration of the intervention (Davis & Reichle, 1996). In the intervention phases, the variant high p- requests, three were randomly chosen from a group of between five and eight requests; with invariant high-p requests, the same three requests were delivered to the participant in the same order. Typically developing peers were chosen to deliver the intervention to the participants during playgroups; the typically developing peers had received training on implementing the high-p request sequences. The results suggest that delivering variant high-p requests are more effective than a high-p request delivered invariantly, when used to increase the appropriate behavior in children with disabilities (Davis & Reichle).

Sanchez-Fort, Brady, and Davis (1995) used high-p request sequences to increase the use of communication behaviors in students with disabilities. The generalized use of low-p target responses was also examined. The participants' instructors dispersed the requests throughout the day in the school setting; three to five high-p requests were delivered to the participants followed by the low-p communication request. Praise was given upon responding correctly to either a high-p or a low-p request. The results showed that the use of a high-p request sequence was effective in increasing the use of target words for both participants; however, response generalization was limited (Sanchez-Fort et al., 1995).

High-p request sequences have also been used to improve academic skills. Lee and Laspe (2003) compared the effects of using a high-p request sequence to the effects of using a verbal prompt in increasing journal writing in four students with learning disabilities. The special education teacher implemented the interventions within the context of instruction in the classroom. In the high-p request phase, three high-p requests were given when the students had been off task for one minute during a writing assignment (Lee & Laspe, 2003). Upon successful completion of those tasks, the low-p request to continue writing was given; in the high-p request and praise phase, verbal praise was given when the students completed each high-p request and after the student had continued to write. During the verbal prompt phase the students were given a prompt to continue writing; in the verbal prompt plus praise phase, praise was given when the students continued to write after being prompted. The results showed the students with the verbal prompt plus praise phase and the high-p request without praise phase were the most effective in increasing the number of words written by the students (Lee & Laspe).

Davis et al., (2000) compared the use of two different interventions to increase successful classroom transitions for two boys with disabilities. The effect of a high-p request sequence was compared to the use of a preferred item as a distractor during the classroom transitions. A distractor can be defined as a preferred item delivered to the child to distract him or her from conditions related to the occurrence of problem behavior (Davis et al.). During regular times of transition in the classroom a high-p request sequence or a preferred item with a distractor was delivered to the participants. The results show the number of successful transitions increased under both intervention conditions (Davis et al.) and teachers rated both interventions as acceptable on social validity assessments.

High-p request sequences have been used as an intervention approach to increase and/or decrease a variety of behaviors in children with disabilities. While not always effective for every child, the use of a high-p request sequence is a highly effective intervention used to increase overall compliance, communication, social interactions, academic performance, and more recently to increase compliance and acceptance of food in children ASD and feeding difficulties. Little, if any research on increasing food acceptance using high-p request sequences, however has been conducted in the school settings.

Setting

Feeding difficulties can occur in any environment. There is a multitude of research on treating feeding difficulties in the clinic (Dawson et al., 2003; Patel et al., 2006; Patel et al., 2007; Penrod, Gardella, & Fernand, 2012) and some research conducted in the home setting (Meier, Fryling, & Wallace, 2012). A majority of the research occurring in clinics stated that the most effective procedures in treating a majority of behavioral feeding difficulties are escape prevention procedures with reinforcement. As with other populations of children with feeding difficulties, multiple behavioral components are used in treatment for feeding difficulties in children with ASD (Ahearn, Castine, Nault, & Green, 2001; Levin & Carr, 2001; Piazza et al., 2002). Little, if any, research has examined feeding difficulties, mainly food selectivity, in the school environments. Research has also not been conducted on evaluating the acceptability, feasibility, and social validity of some of the most effective clinic based intervention strategies, such as escape prevention, in community settings. Escape prevention procedures would likely be too complicated and potentially aversive to implement in most schools. Possible barriers to implementing escape prevention procedures in the school and in the home settings involve a limited number of adults available to assist, not having proper training and/or experience on how

to correctly implement escape prevention procedures, the time and involvement needed, and family priorities. Antecedent interventions including high-p request sequences may be more suitable for use in the school settings.

It is important to find ways to modify behavioral feeding treatment for use in a variety of settings so the child can generalize and maintain the skills learned (Stokes & Baer, 1977). Using escape preventions procedures and reinforcement to treat feeding difficulties generally leads to "quicker" results and is more effective in increasing acceptance and decreasing inappropriate mealtime behaviors (Ahearn et al., 1996; Bachmeyer et al., 2009; Hoch et al., 1994; Piazza et al., 2003; Reed et al., 2004), but may not be appropriate or feasible in all school settings. There is emerging evidence showing the efficacy of using high-p request sequences as an intervention for some behavioral feeding difficulties, however most of the research using high-p request sequences as an intervention for feeding difficulties has been conducted in a clinical setting with one study (Meier et al., 2012) conducted in the home.

Problem Statement

Children with ASD may exhibit impulsivity, sensory sensitivities (aversions to texture of certain foods), restricted and repetitive patterns of behavior including perseveration and adherence to familiar routines, and impairments in social interactions, lack in the sharing in the interests and enjoyment of others (Ahearn, Castine, Nault, and Green, 2001; Cumine, Leach, & Stevenson, 2000; Schwarz 2003). These characteristics may contribute to the feeding high rate of difficulties in children with ASD, however it is important to note that these characteristics only partially explain why behavioral feeding difficulties can occur in children with ASD. As with other behaviors a child may exhibit, there is a function to the behavior of refusing to eat all food or certain foods; most commonly in behavioral feeding difficulties the function is to escape

eating the non-preferred food. This is why escape prevention procedures are generally effective in treating behavioral feeding difficulties. Research has demonstrated that children exhibiting problem behaviors during mealtimes often require the use of escape prevention procedures in order to decrease the problem behaviors and increase the food acceptance, teaching the child he or she will not be able to escape eating by exhibiting the problem behaviors (Patel et al., 2003).

Using escape prevention procedures to treat behavioral feeding difficulties generally leads to "quicker" results and is more effective in increasing acceptance and decreasing inappropriate mealtime behaviors (Ahearn et al., 1996; Bachmeyer et al., 2009; Hoch et al., 1994; Piazza et al., 2003; Reed et al., 2004) however, these studies have primarily been conducted in day treatment clinical settings, with some literature describing the maintenance and generalization of acceptance in the home setting (Ledford & Gast, 2006; Meier, et al., 2012; Sharp et al., 2011). Little, if any, research has examined behavioral feeding difficulties, mainly food selectivity, in the school environment for children with ASD. Escape prevention procedures may not be appropriate for use in all environments, with all children, or with all types of behavioral feeding difficulties, and it is important to find ways to modify behavioral feeding treatment for use in a variety of settings with different people so the skill can be generalized and maintained (Stokes & Baer, 1977).

Some children do not exhibit active problem behaviors such as throwing the food, biting, spitting the food out, kicking, or hitting during mealtimes in order to escape eating. These children have what has been termed of passive feeding difficulties in the research (Meier et al., 2012). For example, when a child has a passive feeding difficulty he or she does not comply when the requests are given to eat a non-preferred food (i.e. keep mouth close and sit still, turn head side to side slowly, a non-verbal way to say no, or verbally say "no"in calm and quiet

voice). While using escape prevention procedure may be effective in treating passive feeding difficulties in other environments, again because once the caregiver removes the food and the request to eat, the child still learns they are able to escape eating, these procedures may not be appropriate or feasible in the classroom setting for children with passive feeding difficulties.

High-p request sequences are appropriate for use in the school setting and have shown to increase compliance to request in some students with disabilities in the school setting (Davis, Brady, Hamilton, McEvoy, & Williams, 1994; Lee & Laspe, 2003; Sanchez-Fort, Brady, & Davis, 1995). Previous research has indicated that the use of high-p request sequences may be effective in treating passive feeding difficulties (Meier et al., 2012; Patel et al., 2007); however high-p request sequences have not been used in the school setting to increase food acceptance for children with ASD. The studies demonstrating the efficacy of high-p requests to treat feeding difficulties have also only used food related requests (i.e. accepting an empty spoon at the mouth or eating preferred foods). Food related high-p requests have not been compared to non-food related requests (gross motor related requests, i.e. clapping hands) for efficacy within a single study.

There is a need for a simple, acceptable, and usable intervention to treat passive behavioral feeding difficulties for children with ASD in the school environment. The use of non-food related and food related high-probability (high-p) request sequences have the potential to provide an effective and socially valid intervention to increase food acceptance in the school setting for young children with passive feeding difficulties and ASD, however it is also important to compare the efficacy of non-food related requests and food related requests in increasing food acceptance in the school setting.

Theory of Change

The theory of change (Figure 1) in this study is that an individualized, evidenced based, behavioral intervention, using high probability request sequences in the school environment, will increase food acceptance in the classroom for young children with ASD and passive feeding difficulties. High-p request sequences have been shown to be effective for children with passive feeding difficulties (i.e. sitting and exhibiting no other behaviors when a non-preferred food is presented, or shaking his or her head to refuse the food). For children with passive feeding difficulties, no problem behaviors (i.e. screaming, hitting, or throwing food) are emitted when a non-preferred food is presented. When problem behaviors are emitted during mealtimes, the objectives would be to decrease problem behaviors and increase the food acceptance behaviors. When the child has a passive feeding difficulties the objective is to increase compliance, thus as previous research suggests, using high-p request sequences interventions may be effective in increasing compliance (eating a non preferred food when asked to).

Focus of the Present Study

The purpose of this study was to investigate the use of food related and non-food related high probability request sequences as interventions to increase food acceptance in the school setting for three children with ASD who are food selective and do not exhibit severe problem behaviors during mealtime. Also being investigated is the efficacy of food related requests versus non-food related requests in increasing food acceptance in the school setting. Specifically the results of the study will be used to answer the following research questions:

- Does the use of a high probability response sequence increase food acceptance in the school setting for children with ASD and a previous history of food selectivity?

- Is using food related high-p requests more effective than using non- food related high-p requests in increasing food acceptance?

Chapter 2

METHODS

Participants and Setting

Three participants with ASD and with teacher and parent reported food selectivity participated in the study. To be eligible to participate in the study, students met the following inclusion criteria: (a) diagnosis of ASD (b) ages 3-5 years old (c) had limited food repertoires that were of concern to parents (d) were able to chew food (e) did not exhibit severe problem behaviors during mealtimes. Limited food repertoires were defined as eating less than five different foods in one primary food group (i.e., protein, starch, fruit, vegetable, or dairy). Limited food repertoires also included parent and teacher reported "picky eating," or unwillingness to try a new food. Children who had documented medical issues around feeding (e.g., acid reflux) and children exhibiting total food refusal were excluded from this study. The participants ate at least three or more different foods (from any food group) and were able to follow at least three simple commands (e.g., clapping their hands, tapping their head, and touching their nose). All interventions took place in the school setting in a school in the Pacific Northwest. Prior to beginning any intervention, parents were contacted to obtain information on their child's eating history, preferences, and history of receiving feeding interventions. A food list was sent home to the parents asking them to list foods they wanted their child to learn to eat. The food list required a parent signature to verify the child was not allergic to any foods listed. On the food list, parents also marked highly preferred foods, i.e., foods that could be used as reinforcers.

Baseline data were collected in the classroom for each participant. The classroom consisted of an extended day classroom for children with ASD. The participant spent half of the school day, two to three days a week, either in the morning before attending preschool or in the

afternoon after they had attended preschool in the extended day classroom. Due to limited available space in the classroom, intervention sessions were conducted in a small room attached to the classroom, in a room separate from the classroom but close in proximity to the classroom, or at a table located outside of the classroom.

Behavioral Measures

Dependent variable (low-p requests). For this study the dependent variable was the percent of responses to low-p requests that children responded to without the presence of interfering or problem behaviors. Low-p requests were food-related requests where the participants were not likely to respond; in this study the low-p requests were requests to eat a non-preferred food. The data on low-p requests were obtained by observing the children during mealtime in the classroom (to collect data on foods refused and accept or requests to eat where there was compliance versus non-compliance).

The low-p request for all students was taking a bite of food. This was defined as initiation of a response within 10 seconds of the request by the researcher, without exhibiting problem behaviors (problem behaviors such as, batting the food away and attempting to bite or hit the researcher), with task completion. For example, a response to a low-p request ("take a bite of yogurt") included opening his or her mouth, placing the food on his or her tongue, and swallowing within 30 seconds. The child was asked to open his or her mouth to verify the food has been swallowed and not packed in the cheeks or below the child's tongue. Ten trials were conducted with each request. Food related requests that resulted in a failure to respond five times or more were considered low-p request. The requests were kept to two or three word requests.

Independent variable (high-p requests). The independent variable was a series of high-p requests given immediately before each low-p request. High-p requests are tasks to which the

child responds to with 80-100% accuracy. The high-p requests were determined similarly to the low-p requests. The requests that resulted in compliance at least 80% of opportunities presented were considered high-p requests, with both food related and non-food related requests. Food related requests included touching an empty utensil to his or her mouth, eating a preferred food, or opening his or her mouth. Non food related requests included motor tasks; for example touching his or her head, clapping hands, tapping the table with hands, or touching his or her nose. The food related group of high-p requests were more limited due both to the limited foods eaten by the participant and that there are less food related request possibilities (such as, holding the food to one's mouth, placing a utensil to one's mouth).

Data Collection

Data was collected during two 10 trial sessions daily, averaging from 10 to 15 minutes per session. The sessions were conducted Monday through Friday with the exception of school holidays and days the participant was absent. Each intervention session was videotaped for data collection purposes. At a later time, trained observers watched the videotape of the session and collected data on the number of responses to high-p and low-p requests within ten trials. Percentage of appropriate responses were calculated separately for high-p requests and low-p requests by dividing the total number of responses by 10, the number of high-p requests and low-p requests given by the trained observer in one session. Sessions were recorded to also collect data on the accuracy of the researcher's implementation of the procedures across sessions and to code for reliability. Data was collected using event-recording procedures; each time the student complied to a high-p request or low-p request a "+" mark was written on the data collection sheet, and each time there was no compliance to a high-p request or a low-p request a "-" was written on the data collection sheet.

Interobserver Agreement

Interobserver agreement data was obtained by having a second observer independently collect data during 33% of the video taped sessions for participants. Agreement occurred when both of the observers agreed on the number of occurrences of compliance to low-p requests and high-p requests. Interobserver agreement was collected for 33%, 20%, and 29% of baseline sessions and 27%, 33%, and 43% of intervention sessions for Greg, Helena, and Dexter respectively. Interobserver agreement was calculated by dividing the number of agreements for each session by the total number of agreements and disagreements and then multiplying this number by 100. Interobserver agreement for Greg was an average of 98% (range 90%-100%), for Helena, 100%, and the average for Dexter was 98% (range 90%-100%).

Procedural Fidelity

The second observer viewed the videos of the intervention sessions and independently collected procedural fidelity data. Fidelity data was collected for all of high-p request sequence intervention sessions for Greg, Helena, and Dexter. Procedural fidelity was calculated by dividing the number of total number of implementer behaviors by the total number of planned implementer behaviors and multiplying by 100 (Billingsley, White, & Munson, 1980). The data indicated that the intervention was implemented with an average of 95.2% fidelity (range = 91.8% to 100%).

Research Design

The effects of high-p requests on the percentage of low-p requests were evaluated using a multiple baseline across subjects with an alternating treatment design. An alternating treatments design was used to compare the two different high-p interventions for each participant. With the

alternating treatment design, the two treatments were alternated in rapid succession and correlated changes were plotted on a graph to compare the efficacy of the two interventions (Cooper, Heron, & Heward, 2007).

In this study, the alternating treatments design was used to evaluate and compare the efficacy of the food related high-p requests intervention and the non-food related high-p requests intervention. Each condition (food-related requests and non-food related requests) was implemented each day across two separate sessions; randomly alternating daily the order of which intervention was implemented first. For example, during the first day of intervention during the first session, the non-food related high-p request intervention was implemented and during the second session on the first day the food related high-p request intervention was implemented. During the first session on the second day of intervention, the food related high-p request intervention was implemented and the non-food related high-p related was implemented during the second session of the day. Each day, the order of which condition was implemented first randomly alternated as described above.

The multiple baseline design shows the effects of an intervention by showing that the behavior changes only when the intervention is implemented, demonstrating experimental control (Kazdin, 1982). In a multiple baseline across participants design baseline data is collected for the same behavior (compliance and non-compliance to a request in this study) and once the behavior reaches a stable rate, the intervention is implemented with one participant while baseline conditions are continued for the other participants; with the behaviors for the other participants expected to remain at baseline levels. The procedures are continued until the intervention was implemented with all of the participants.

Procedures

Baseline. All baseline sessions were videotaped. Acceptance or compliance to the low-p request was considered taking the bite, putting it in his or her mouth within five seconds, without spitting the food out of his/her mouth. In baseline, a trained observer collected data on the acceptance of bites the participants took of non-preferred foods (low-p); this occurred in the classroom during mealtime with the participants' peers. Only non-preferred (low-p) foods were presented and a session consisted of 10 bite trials. All of the foods (low-p requests) were presented with regular texture. To begin the trial, the researcher placed the food on a plate and the request of "take a bite" was presented to the child. Dependent on whether the child was a self-feeder, the researcher either presented the food to the child with the use of a utensil or the child was expected to pick up the food with his or her hands or the use of the utensil. If the child moved or pushed the plate away, said "no," or did not accept the bite, the plate was be removed and the next trial began after a 30 second interval. Compliance resulted in verbal praise.

For Participant one, baseline data was collected for three sessions. Once the data showed that responding was stable, the high-p requests interventions, food related and non-food related requests, were implemented for Participant one. While Participant one received interventions, baseline continued for Participants two and three. Once there was stable responding for Participant two, the high-p food related requests and non-food related requests interventions were implemented for the second participant, while observers were still collecting baseline data for the third participant. The high-p food related requests and non-food related requests interventions were then implemented for the third participant when there was stable responding in baseline.

Intervention.

Food related high-p request condition. A group of food related high-p requests were determined prior to implementation of this condition. The high-p food related requests were determined before intervention was implemented, during a compliance assessment. The researcher sat in front of the participant to deliver the food related high-p requests. The food related high-p requests were delivered immediately before the low-p request of "take a bite of the non-preferred food" was presented. Three high-p requests were presented quickly and immediately prior to delivering the low-p request, praise (high-5, thumbs up, or saying "good job") were given for each response to the high-p request, then the low-p request was delivered within five seconds of delivering the last high-p request. If the participant did not respond to the high-p request, the researcher continued to deliver requests to the participant until the participant responds no less than two times consecutively, and then the low-p request was delivered. The time between high-p requests was 3-5 seconds. The session consisted of 10 trials.

Food related high-p request enhanced condition. In this phase of the intervention no more than 3 trials of food related high probability requests in a row were given. Following the set of three or fewer trials, the participant had approximately 90 seconds to engage in a preferred activity. When the preferred activity was completed, again no more than three trials of food related high-probability request sequences were implemented. This continued until the 10 trials were completed. Using a continuous reinforcement schedule (CRF) participants were provided with contingent access to preferred items and activities contingent on correct responses to high p requests.

Non-food related high-p request condition. A group of non-food related (motor tasks) high-p requests were determined prior to implementation of this condition. The researcher sat in

front of the participant to deliver the non-food related high-p requests. This condition included high-p request sequences of gross motor actions occurring in rapid succession (3-5 seconds), and then for the low-p request the researcher said, "Take a bite of non-preferred food" and the bite of non-preferred food was presented. The high-p requests were presented in random order in each trial. For example, in the first trial the participant may have been asked to touch his or her head, then touch the table, and finally clap his or her hands and the second trial may have included asking the participant to touch the desk, clap his or her hands, and finally touch his or her ear. The high-p request sequence included at least one different high-p request than in each previous trial, dependent on the total number of high-p requests in the group of high-p request that had been determined in the compliance assessment.

Three high-p requests were presented quickly and immediately prior to delivering the low-p request, praise (high-5, thumbs up, or saying "good job") were given for each response to the high-p request, then the low-p request was delivered within five seconds of delivering the last high-p request. If the participant did not respond to the high-p request, the researcher continued to deliver requests to the participant until the participant responded no less than two times, and then the low-p request was delivered. The time between high-p requests was 3-5 seconds. Each session consisted of 10 trials.

Non-food related high-p request enhanced condition. In this phase of the intervention, no more than 3 trials of non-food related (motor task) high probability requests were given in a row. Following the set of three or fewer trials, the participant had approximately 90 seconds to engage in a preferred activity. A wider variety of non-food related requests were used, compared to the number of food related requests (dependent on the number of high probability requests determined beforehand). When the preferred activity was completed, again no more than three

trials of non-food related high-probability request sequences were implemented. This continued until the 10 trials were completed. Using a continuous reinforcement schedule (CRF) participants were provided with contingent access to preferred items and activities contingent on correct responses to high p requests.

Escape prevention (Participant 1). In this phase, the researcher simultaneously said, "Take a bite," while presenting the spoon directly to the participant's upper lip. When the participant accepted the whole bite within 10 seconds the researcher provided enthusiastic, brief verbal praise. When the participant took the bite, 30 seconds was allowed for a mouth clean (swallow). Mouth clean was defined as no piece of food larger than the size of a pea left in the child's mouth. At the end of the interval, the participant was asked to open his mouth to show if he had swallowed all of the food (larger than the size of a pea). When the participant had demonstrated mouth clean, he received enthusiastic verbal praise and access to a preferred item for 30 seconds. If the participant did not accept a bite within 10 seconds, the researcher continued to hold the spoon to his lip until he accepted. All refusal behaviors were ignored and if the participant tried to disrupt the presentation of the food, the second therapist gently blocked his hands.

Sessions continued until ten bites were presented or the allotted amount of time (20 minutes) elapsed. If the participant expelled any food larger than the size of a pea that had been previously been in his mouth, it was immediately scooped back up or a new bite comparable in size to the one expelled was obtained. The spoon was then held to the participant's lip and the researcher provided the prompt, "Finish your bite." Escape prevention procedures were discontinued after three sessions at the request of the parent.

Generalization. One generalization session occurred in the classroom for Participant 1 during a mealtime. The researcher sat away from the table and the child but close enough to observe the child's mealtime behavior. The generalization session was video taped for data collection purposes. Ten bites of the previously non-preferred foods were placed on a plate in front of the child. A teacher told the child to take a bite. Data was collected on the number of bites of non- preferred foods accepted throughout the meal.

Social Validity. Upon completion of the study, the teachers were given a questionnaire to assess social validity. The questionnaire had questions on the need for intervention for the participants, on ease implementation of the intervention in the school setting, their opinion on the effectiveness of the intervention, the acceptability the intervention procedures, and whether they, the teacher, would be likely to use a similar intervention for students with feeding difficulties in the future. All questions were given on a scale of 1-5, with 1 representing "completely disagree" and 5 representing "completely agree." The questionnaire also had a place for teachers to write comments.

Chapter 3

RESULTS

Greg

High Probability Requests. Figure 2 (top panel) depicts compliance to non-food related requests (motor requests) in the compliance assessment. The requests included "wave hands," "give me five", "touch ears," "touch eyes," "stomp feet," "clap hands," "tap the table," "touch nose," "pat knees," and "touch head." Compliance to the motor related tasks were high during the compliance assessment with 80% to 100% compliance for all requests except for "touch ears," where compliance was 70%. Figure 2 (bottom panel) depicts compliance to food related requests in the compliance assessment. The food related requests included "cup to mouth," "spoon to mouth," "fingers to mouth," "touch the plate," and "touch the spoon." Compliance to the food related requests during the assessment was high at 100% compliance for each of the requests. Greg's average percent compliance to high-p requests across intervention sessions was 99.7%. In the two sessions where the high-p requests enhanced interventions were implemented, Greg responded to 100% of the food related requests and non-food related (motor request) high-p requests.

Acceptance of Bites. Figure 5 depicts the percentage of acceptance across each phase. Acceptance of non-preferred foods was 0% across five sessions of baseline. When the non-food related (motor task) high-p request intervention was implemented, acceptance was 20% in the first session, while acceptance remained at 0% in the first session using food related high-p request intervention. Across the next four sessions acceptance remained at 0% across both the food related and motor related high-p request interventions. In the high-p request enhanced phase, with both interventions, food related requests, and non-food related requests sessions, acceptance

remained at 0% across two sessions. When escape prevention was implemented, acceptance of non-preferred foods increased to 50%, 100%, and 100% respectively across three sessions. The generalization probe showed acceptance of non-preferred foods remained high at 80%. No maintenance data were collected.

Helena

High Probability Requests. Figure 3 (top panel) depicts compliance to non-food related (motor task) requests in the compliance assessment. The non-food related requests included "wave hands", "give me five," "touch ears," "touch eyes," "stomp feet," "clap hands," "tap the table," touch her nose," and "touch head." Compliance to motor task requests were 0% with "touch ears" and "touch eyes," 10% with "wiggle fingers" and "stomp feet," 90% with "touch nose" and "touch head," and 100% with "clap hands." Figure 2 (bottom panel) shows compliance to food related requests in the compliance assessment. The food related requests included "put the cup to her mouth," "put the spoon to her mouth," "put her fingers to her mouth," "touch the plate," and "touch the spoon." Compliance to the request "fingers to mouth," was 0%, compliance to the request to put the "spoon to mouth," was 60%, and compliance was 100% with the requests to "touch plate," "pick up soon," "touch spoon," and "cup to mouth," in the compliance assessment. Helena's percent of compliance to high-p request across intervention sessions was 85.4%. Helena's average percent compliance to high-p requests in the final sessions of intervention was 90%.

Acceptance of Bites. Figure 5 depicts the percentage of acceptance across each phase. Helena's acceptance of non-preferred food in baseline was 0% across five sessions. In the first session of the high-p food related request intervention and the first intervention session of the non-food related high-p (motor task) request intervention, acceptance of non-preferred food

remained at 0% acceptance. In the first session of the high-p food related request enhanced intervention phase her acceptance remained at 0%. In the second session of the non-food related high-p requests enhanced intervention phase, her acceptance of non-preferred food increased to 70% in food related request enhanced intervention session. In sessions, two, three, and four, of the food related high-p enhanced intervention, acceptance of non-preferred food was 40%, 30%, and 40% respectively. In sessions five, six, and seven of the food related high-p enhanced intervention, acceptance of non-preferred food was 40%. In the final session of food related high-p enhanced intervention, acceptance was 70%. Helena accepted 0% of bites presented in the first session of the non-food related high-p request enhanced intervention. In sessions two, three, and four of the non-food related high-p request enhanced intervention, 20% of the bites of non-preferred food were accepted. Acceptance of non-preferred food in the non-food related request high-p enhanced intervention session was 30% and in session seven, acceptance was 20%. In the final session of the non-food high-p request enhanced intervention, acceptance was 20%. No generalization or maintenance data were collected.

Dexter

High Probability Requests. Figure 4 (top panel) depicts compliance to non-food (motor related requests) related requests in the compliance assessment. The requests included "wave hands," "give me five", "touch ears," "touch eyes," "stomp feet," "clap hands," "tap the table," "touch nose," and "touch head." Compliance to the non-food requests was high during the compliance assessment 100% for all requests except to wiggle fingers, which was 0%. Figure 3 (bottom panel) depicts compliance to food related requests in the compliance assessment. The food related requests included "put the cup to his mouth," "put the spoon to his mouth," "put his fingers to his mouth," "touch the plate," "eat gold fish," and "touch the spoon." Compliance with

the food related requests during the compliance assessment were high with 90% to 100% compliance for all but one request; compliance to the request "spoon to mouth" was 0%. Dexter's average compliance across sessions to non-food related (motor tasks) requests and food related requests was 97 %.

Acceptance of Bites. Figure 5 depicts the percentage of acceptance across baseline and the high-p request enhanced intervention phase. Acceptance was 0% percent in the first five sessions of baseline, 10% in the sixth session, and 0% in the seventh session of baseline. Acceptance was 0% in the first session of the food related request and the non-food request high-p enhanced intervention sessions. In the second sessions of intervention for food related requests and non-food related requests, acceptance was 20% and 50% respectively. Acceptance of non-preferred foods in the third session of the non-food request intervention was 70% and acceptance of non-preferred foods in the third session of the food related request intervention was 80%. In session four, five, six, and seven of the high-p food related request enhanced intervention sessions, acceptance was 70%, 50%, 60%, and 80% respectively. Acceptance of non- preferred in sessions four, five, six, and seven in the non-food request enhanced intervention session was 50%, 70%, 70%, and 80% respectively. No generalization or maintenance data were collected.

Social Validity

Social validity questionnaires were given to two head teachers and two assistant teachers upon the completion of intervention. All four teachers rated the importance of increasing food acceptance for the participants and the acceptability of using high-probability request sequence interventions as a five on a scale of one to five, with one being completely disagree and five being completely agree. Two teachers rated the interventions used as a five, completely agreeing the intervention was effective in increasing the participants' food acceptance in the school setting.

The other two teachers rated the efficacy of the intervention as a three and a four. All of the four teachers ranked the likelihood of using high-p request sequences in the future with other students in the school setting as a five, completely agreeing that they would use the intervention in the school setting in the future with other children that are picky eaters. Each of the four teachers rated the acceptability of using high-p request sequences (the original intervention and the enhanced intervention) to increase food acceptance in the school setting as a five, completely agreeing the intervention was acceptable to use in the school setting. Included blow are specific teacher comments:

Teacher one commented, " I feel like the period of the intervention was too short, with the students who have such a long history of food rigidity… to see a major impact. I do think this is historically an effective type of intervention and I will use it again in the future." Another teacher commented, there was… " A great response to the individual needs of the students, communicating with the families, and adapting the intervention."

Chapter 4

DISCUSSION

The results of this study demonstrate that as a result of specialized intervention, all three participants increased their food acceptance in the school setting. For two of the participants, high-probability request enhanced interventions were effective in facilitating this change in behavior. For the third participant high-p request sequences (initial intervention and enhanced) were not effective but once the escape prevention procedures and DRA were implemented, the rate of food acceptance increased dramatically and this behavior generalized across settings. In this section I will discuss a summary of the findings, implications of the study, limitations and future research, and the practical relevance of the study.

Summary of the Findings

The first participant's (Greg) food acceptance did not increase with the use of the food-related and non-food related high-p requests or with the high-p request enhanced interventions (food related requests and non-food related requests). Only when escape prevention procedures with DRA were implemented was there an increase in this participant's food acceptance. It is difficult to say whether the use of the high-p request interventions prior to the implementation of escape prevention procedures and DRA had an effect on his increase in acceptance in the escape prevention sessions. Greg's compliance to high-p requests, both food-related and non-food related (motor task requests) remained high throughout the high-p requests intervention even though food acceptance did not increase. After consulting with an expert in high-p request interventions, the high-p request enhanced interventions were implemented. There was still no change in acceptance for Greg after implementation of the high-p requests enhanced interventions. After consulting with his parents, escape prevention procedures and DRA were

implemented in the school setting. In the first session of escape prevention, refusal behaviors such as crying, screaming, turning his head, attempting to slide out of his chair, and behavioral emesis were exhibited. This first session was ended after 20 minutes with only half of the bites being accepted. Refusal behaviors decreased in the second session, with only some whining and crying exhibited. Acceptance increased in the second session of escape prevention, with Greg accepting all of the bites presented. Greg's refusal behaviors continued to decrease in the last session of escape prevention and he again accepted all of the bites presented. The escape prevention session resulted in generalized changed to the classroom and reported generalized behavior change at home.

Escape prevention procedures and DRA have been shown to be effective for a majority of children with feeding difficulties and have demonstrated some success in generalized improvement across time and settings (Girolami & Scotti, 2001; Najdowski et al., 2008; Piazza et al., 2003; Riordan et al., 1984). To increase Greg's food acceptance we had to use escape prevention procedures and DRA in the school setting. The research has shown escape prevention and reinforcement are effective for increasing food acceptance, however these procedures are unlikely to be acceptable in the school setting, given the need for specialized training. This suggests a continuum of approaches that can be used to address feeding difficulties.

Initially, the high-p request interventions (the initial intervention) were ineffective in increasing food acceptance for the second participant (Helena) even though her compliance to high-p requests in these sessions was relatively high. After consulting with an expert in high-p request interventions, the high-p request enhanced interventions were implemented. The high-p request enhanced interventions (food related requests and non-food related requests) were not initially in effective in increasing Helena's food acceptance, even though compliance to high-p

requests remained relatively high. In the second session of the food related high-p request enhanced intervention, her food acceptance dramatically increased. Consistent with previous research on using high-p requests (which were more akin to the high-p request enhanced interventions to increase food acceptance) used to increase food acceptance (Patel et al., 2006) her food acceptance, or compliance to the low-p task, increased more in the food related high-p request enhanced intervention sessions, although there was some increase in food acceptance in the non-food related intervention sessions. It is difficult to say whether participation in the initial high-p request interventions (food- related and non-food related), even with only one session each of the initial food related and non-food related high-p request sequences interventions, had an impact on the levels of acceptance for Helena with her acceptance across sessions being lower then Dexter's. Overall, the high-p request enhanced interventions were more effective in increasing Helena's food acceptance, with a moderate increase in food acceptance across the sessions in the food related and non-food related (motor requests) high-p request enhanced intervention sessions.

The third participant (Dexter) participated solely in the high-p request enhanced interventions. He had no acceptance in the first food related or non- food related high-p request enhanced intervention sessions however; his compliance to high-p requests was high. His compliance to high-p requests remained high throughout the intervention sessions. Dexter had the greatest increase in food acceptance, or compliance to the low-p requests, in the high-p requests enhanced intervention sessions, of all of the participants. He appeared to be happy to participate in the intervention sessions and appeared to like when he was given enthusiastic praise (smiling and laughing, sometimes saying, "I love trying new food") after accepting a bite of non-preferred food. Contrary to other previous research on high-p request interventions (more

akin to the high-p enhanced intervention in this study) and increasing food acceptance, his acceptance of non- preferred food was higher with the non-food related (motor task requests) intervention in a majority of the intervention sessions.

The research has described feeding difficulties as prevalent in children with ASD, with an estimation of up to 80% having feeding difficulties including consuming a limited variety (less than 20 different foods) with the possibility of half of the children having vitamin and nutrient deficiencies (Cornish, 1998; Kerwin, 1999; Kodak & Piazza, 2008). Although one of the purposes of this study was to compare the efficacy of food related request and non-food related requests, the ultimate goal was to help increase food acceptance in the school setting for all three participants. The results of the study regarding which high-p request intervention (both the initial and the enhanced interventions) was more effective in increasing food acceptance (food related high-p request plus or non-food related high-p requests enhanced) were inconclusive. It is important to note, however, that food acceptance increased for all three participants, even if acceptance was increased using different interventions. There is a possibility that food acceptance increased for each participant because at some point each child participated in the initial and the enhanced high-p request interventions, whether the increase in acceptance was in the food-related intervention or non-food related intervention, or in the escape prevention sessions.

Like other types of behavior, behavioral feeding difficulties in children are maintained by their consequences (Shore & Piazza, 1997). Sometimes feeding difficulties are maintained with positive reinforcement (the child is given attention when refusing to eat and this is reinforcing to the child) and many times the feeding difficulties are maintained by negative reinforcement. A majority of the previous research however, has not discussed conducting functional analyses

(FAs) of mealtime behavior for children with ASD and feeding difficulties. Finding the function of a particular behavior is an important component in developing an appropriate intervention for a child (Dixon, Vogel, & Tarbox, 2012). Although FAs have not been conducted to determine the function of mealtime behaviors in a majority of the literature, determining the function of mealtime behavior could be beneficial in determining with techniques to implement with a child with a feeding difficulty in any environment. There are a small amount of studies that have included the use of a FA to determine the function of mealtime behaviors (Girolami & Scotti, 2001; Najdowski et al., 2008; Piazza et al., 2003; Riordan, Iwata, Finney, Wohl, & Stanley, 1984). Some researchers have suggested that some feeding difficulties develop partly due to interactions with the environment, through positive and/or negative reinforcement and some are at least somewhat maintained by negative reinforcement (escape of the mealtime or the food) and that problem behaviors during mealtime are often maintained by positive reinforcement (Ahearn et al.; Cooper et al., 1999). Less research has examined what variables maintain the feeding difficulties; understanding this may be beneficial in developing an appropriate treatment based on the variables that maintain the mealtime behaviors (Piazza et al., 2003).

Implications

The current number of children diagnosed with ASD is approximately one in 88 children (CDC, 2012) and up to 80% of children with ASD are described as food selective (Kodak & Piazza, 2008). Some of the reasons suggested for the high rate of feeding difficulties in children with ASD may be due to impulsivity, sensory sensitivities (aversions to texture of certain foods), restricted and repetitive patterns of behavior including perseveration and adherence to familiar routines, and impairments in social interactions, lack in the sharing in the interests and enjoyment of others (Ahearn et al., 2001; Cumine, et al., 2000; Schwarz 2003). This study

extends the research on feeding literature in a few ways. Clearly, if public schools are going to meet the needs of children with ASD in a comprehensive and effective manner, teachers must have access to evidence based intervention strategies that can address feeding difficulties in the school setting. Thus, it is important to use interventions that are acceptable and sustainable in the particular setting. The purpose of social validity is to evaluate the sustainability and acceptability of an intervention where the consumers should be asked about the acceptability of the goals of the interventions, the methods, the ease of implementing the interventions, the outcomes for the participants, and if they would be likely to use the intervention in the future (Schwartz & Baer, 1991). To evaluate the social validity of using the initial and the enhanced high-p request interventions in the school setting in this study, the teachers were given a questionnaire.

As previous research has stated if the consumers do not like the intervention they are less likely to use it in the future, or may try to completely avoid participation in or use of the particular intervention (Foster & Mash, 2000; Kazdin, 1997, Kazdin & Kendall, 1998). The teachers in this study found all of the high-p requests interventions to be acceptable for use in the school setting however, the school where the study was conducted is a unique environment. The teachers participate in continuous and ongoing trainings, a number of teachers have a background in behavior analysis, there is an inclusive learning environment, collaboration among the professionals, as well as between the parents and professionals. This limits the ecological validity of the study. Most public schools do not have the same resources or a majority of professionals having a background in behavior analysis, or the ongoing trainings that this school has. This may make implementing high-p request sequences more difficult in a

typical public school setting and the professionals in these schools may not find the use of high request sequence interventions as acceptable to use in the school environment.

The study was conducted in the school setting with the goal of finding an intervention that is acceptable and sustainable in that environment. Little, if any, previous research has examined treating feeding difficulties in the school setting specifically for children with ASD. The research conducted in this environment has examined increasing the variety of food eaten and making healthier food choices for groups of typically developing children (Hendy, 1999; Hendy, 2002; Hendy& Raudenbush, 2000; Hendy, Williams, & Camise, 2005; Stark, Collins, Osnes & Stokes,1986). The most effective intervention in increasing the food acceptance in the school setting for groups of typically developing children have multiple components such as peer modeling, token reinforcement, repeated exposure to food, and food choice (Hendy et al., 2005). This research however has not included children with ASD. Reasons that support developing group interventions in the school setting for children with ASD and feeding difficulties are overall nutrition, prevention of more serious feeding difficulties, a way to provide interventions to a larger number of children, and the benefit of receiving treatment with peers, which may make the feeding interventions more acceptable for children, parents, and teachers (Williams & Foxx, 2007). It is also important to find ways to modify behavioral feeding treatment for use in a variety of settings so the child can generalize and maintain the skills learned (Stokes & Baer, 1977).

Second, the study compared the efficacy of non-food related high-p request sequences and food related high-p request sequences (the initial and the enhanced interventions) to increase compliance to the low-p request of taking a bite of non-preferred food. The results from the study are inconclusive regarding whether food related high-p request initial and enhanced

interventions were more effective in increasing food acceptance in the school setting than non-food related interventions. This suggests that what is effective for one child in increasing food acceptance may not be as effective for another child. This supports the conclusion that as with other interventions for children with ASD, feeding interventions should be individualized, designed to meet the needs of each child (Barton, Lawrence, & Deurloo, 2012). Finding the function of the food refusal behavior may be an important component in designing the most effective feeding intervention for children with ASD in the school setting. The main purpose of the study was to increase food acceptance in the school setting using high-p requests sequences and as previously mentioned, the high-p request enhanced interventions were more effective in increasing food acceptance in the school setting than the original high-p request interventions in this study for a majority of the participants.

Finally, there is little, if any research on treating feeding difficulties that specifically examine the efficacy as well as the social validity of using an intervention to increase food acceptance in the school setting for children with ASD. The teachers of the participants in this study responded by saying they were all likely to use high-p request sequence interventions (high-p and high-p enhanced) in the future for students with ASD and feeding difficulties; not discriminating between which high-p request intervention they were likely to use, food related requests or non-food related requests. This suggests the teachers may believe they could implement the initial and the enhanced high-p request interventions. It is also possible that the two interventions, food related requests and non-food related requests could be combined into one intervention, which may be more sustainable in the school setting. The teachers may feel more comfortable using a combination of requests and thus not have to worry about implementing the "wrong" high-p request intervention (food related or non food related). With

combining the two types of requests there are likely more motor task requests or non-food related requests that students have a high probability of completing. Combining requests could also increase the use of variant high-p requests; in combining food related and non-food related requests there would be more of a variety of sequences in which to present the requests to the child. Research shows that the use of variant high-p request sequences results in more compliance to a low-p request (Davis & Reichle, 1996) however, using a combination of food related and non-food related requests to increase food acceptance in the school setting has yet to be investigated. The current study found both non-food related and food related high-p request enhanced interventions to have an effect on increasing food acceptance for a majority of the participants in the school setting however, the efficacy varied for each participant. The findings in the present study should be viewed in the context of several limitations.

Limitations

One limitation to the study was a lack of maintenance and generalization data being collected. Only one generalization data point was collected solely for Greg after the completion of the escape prevention and differential reinforcement intervention. Although the generalization probe showed food acceptance remained high in the classroom, more data should have been collected. Unfortunately, due to time constraints and data collection beginning toward the end of the school year, the present school year ended before maintenance and generalization data could be collected for Helena and Dexter.

The environment where the study took place limits the ability to generalize the results of the study to other school environments. Most other school public school environments are not like the school where the study took place. Although the environment of the school on the campus of a large university in the Pacific Northwest could be considered an ideal environment

for all children, it is not an environment one may see in a typical public preschool or elementary school. The teachers are exceptionally skilled (as are many teachers elsewhere) with continuous and ongoing trainings, master's level students of the university learn and teach in the environment, a number of teachers have a background in behavior analysis, there is an inclusive learning environment, ongoing supervision by some of the most respected professors in their specific areas of expertise in the field of education, as well as PhD students, and there in collaboration among the professionals, as well as between the parents and professionals. Many of the teaching methods, techniques, the inclusive learning environment, and the collaborative team process used in the school are supported by research (Barton et al., 2012; Hanson & Bruder, 2001; DEC/NAEYC, 2009). Research is conducted throughout the year at this particular school as well. This all makes for a very unique and ideal learning environment. Unfortunately, the current structures of other schools may limit, at first, the use of the high-p interventions in the school setting. There may not be an inclusive learning environment, collaboration between parents and professionals may be lacking, and teachers may not have a variety of different educational training backgrounds in other public school settings.

Research has shown the effectiveness of using a high-p request sequence to influence the occurrence of a low probability behavior for children with disabilities (Davis et al., 1994; Lee & Laspe, 2003; McComas, et al., 1998; Patel et al., 2007). Teachers and parents have also reported on the efficacy of the strategy and the acceptability of using high-p request sequences (Ardoin, Martens &Wolfe, 1999; Davis et al., 2000; Ducharme & Worling, 1994; Killu et al., 1998; Meier et al., 2012). There is emerging evidence showing the efficacy of using high-p request sequences as an intervention for some behavioral feeding difficulties (Dawson et al., 2003; Meier et al., 2012; Patel et al., 2006; Patel et al., 2007; Penrod, Gardella, & Fernand, 2012). Certain studies

however, also reported that the use of a high-p request sequence did not produce compliance at high levels without the use of additional intervention procedures (Dawson et al., 2003; Zarcone, et al., 1994). The efficacy of the interventions in increasing food acceptance, compliance to the low-p requests, varied for the three participants. There are several possible reasons for the varying efficacy of the intervention in increasing food acceptance. With two of the participants it is likely their food selectivity was maintained more by negative reinforcement then by positive reinforcement. Thus, when the caregiver presented the food and the child said no or spit the food out, the child learned they could escape eating the non-preferred food during mealtimes. With the likelihood of this having occurred in multiple environments, there may be a stronger history negative reinforcement for these two participants.

A major limitation to the study was the design of the initial high-p request interventions and the use of procedures in these interventions. In the study, mass trials of 10 were used in the original high-p request sequence intervention, with praise as the reinforcement provided after complying the high-p requests (food related and non- food related requests). Participation in the initial high-p interventions may have contributed to the lower acceptance rates of non-preferred for two of the three participants, where allowing the two participants to escape the bites in close succession reinforced refusal of non-preferred foods.

The design of the initial high-p request interventions was based more on the feeding research (Dawson et al., 2003; Meier et al., 2012) and the researcher's previous experiences in treating feeding difficulties, than other research on use of high-p request sequence interventions. Research on using high-p request sequences, such as in the study by Davis et al., (1992) ran sessions with no more than 4 trials occurring in one session, up to three times per day. In another study by Davis et al., (2000) there was no set amount of trials per session, data were collected

when an identified transition occurred, on average, five times total throughout the school day. Meier et al., (2012) implemented a high-p food related request intervention to increase food acceptance where there were 10 trials, consisting of 4 bites in each trial (3 bites of preferred foods and then 1 bite of non-preferred food) and totaling 40 bites per session. Dawson et al., (2003) continued feeding intervention sessions until 12 bites were consumed. Brief praise was used after complying with the high-p request in the aforementioned studies. It is important to note that the efficacy of a high-p request intervention may be improved with the use of higher quality reinforcers (Mace, Mauro, Boyajian, & Eckert, 1997), such as in the high-p request enhanced interventions in this study. Mace et al., (1997) stated that there is generally a consistent relationship between reinforcer quality and increasing compliance when using high-p request sequences and that the efficacy of high-p request sequence can be improved with the use of a higher quality reinforcer than praise, such as a preferred food. In this study, a majority of the participants were successful in increasing food acceptance when the high-p request enhanced interventions were implemented, where higher quality reinforcers were used after complying to high-p requests, no more than 3 trials were implemented at a time, and the participant had access to preferred activities between the sets of 2 to three trials.

According to Davis and Reichle, (1996), the use of variant, or high-p requests given in varying sequences high-p requests, result in more compliance to a low-p request. Zarcone et al. (1994) stated that it is possible that the invariant high-p sequences may make the high-p requests easier for the child to discriminate as part of a chain of events that predictably precedes a discriminative stimulus to act, or in this study to take a bite of non-preferred food. There is the possibility that in this study the participants learned or were better able to discriminate that they would be asked to take a bite of non-preferred food after complying with the limited variety of

food related high-p requests. Having a limited amount of high-p requests to present to the child in varying sequences in the food related request intervention might have impacted the increase in acceptance for some of the participants. The use of varying high-p request sequences in the non-food related request intervention sessions could have contributed to the overall higher percentage of acceptance for Dexter in these sessions. The possibility exists that the function of one of the Dexter's food refusal at mealtimes was more to obtain attention, which he received when he accepted bites of the non-preferred food, then to escape eating the non-preferred food. It is more difficult to speculate why the high-p request sequences interventions were more effective for two the three of the participants without knowing the function(s) of particular mealtime behavior.

Direction of Future Research

The purpose of this study was to extend previous research on treating feeding difficulties in children with ASD by examining the efficacy and sustainability high-p request sequences in the school setting to increase food acceptance. Although research has shown the use of high-p request sequences to be effective in increasing compliance to a variety of requests for children with a range of disabilities (Davis et al., 1994; Lee & Laspe, 2003; McComas, et al., 1998; Patel et al., 2007) in multiple environments, the research on using high-p request sequences to increase food acceptance is limited. It is important to develop interventions that are acceptable and sustainable in the clinic, the home, and the school setting.

Future research should include data collection on generalized food acceptance across settings and people when high-p request sequences interventions are implemented. Data should also be collected on the maintenance of the gains in food acceptance made during feeding interventions. It is important to determine the sustainability of the intervention for the benefit of the children participating and the parents and the teachers assisting in decreasing the feeding

difficulties. More research should be conducted in a variety of preschool and elementary school settings to assess the efficacy and the social validity of supporting an increase in food acceptance in children with ASD with behavioral interventions, such as high-p request sequences.

More research is needed on the benefits and necessity of conducting functional analyses to determine the function of the problem behaviors at mealtime before implementing interventions to treat feeding difficulties. The research has stated (Meier et al. 2012) high-p request sequences are more likely to be effective for children with passive food refusal, meaning they do not exhibit problem behaviors during mealtimes, however it also possible that high-p request sequences may be more effective for feeding difficulties or problem behaviors maintained by attention, more research is needed. According the research (Piazza et al., 2003) problem behaviors and feeding difficulties in children are likely in part maintained by negative reinforcement, the child is allowed to escape eating the non- preferred foods. Piazza et al. also states however, that conducting a functional analysis in the natural environment to determine which consequences or combination of consequences affect the mealtime behaviors may be difficult. Thus, if determining the function of the problem behaviors at mealtime are more feasible in a clinic setting this may pose a problem for children that do not have access to any services outside of school, especially with a lack facilities and trained professionals working on increasing food acceptance through the use of behavioral interventions in the western United States.

The design and the use of procedures in the initial high-p request interventions were flawed according to the research on using high-p requests to increase compliance to a low-p request (Davis et al, 1992; Davis et al., 2000) with the use of mass trials and only praise (Mace et al., 1995) for reinforcement after complying to a high-p request. More research is needed to

examine the efficacy of using what is termed in this study as high-p request enhanced interventions, using higher quality reinforcers, no more than 3 trials at a time, and access to a preferred activity after 3 trials have been conducted. Future research should also examine the efficacy of high-p request interventions implemented more naturally, embedding the requests into mealtimes with peers, having no set trials in a session, and possibly having peers provide praise to the child with ASD.

Feeding interventions that are accessible and sustainable across settings need to be investigated further. It is possible that a majority of children will need an intervention that includes the use of escape prevention procedures and differential reinforcement to begin remediating feeding difficulties. However, it is also possible we should look at feeding difficulties interventions designed to increase food acceptance in a tiered fashion (Figures 6 & 7). Beginning first with a universal or more global intervention that is applied with all children in the home or in the school, the introduction of a well balanced diet and education for school staff and parents on strategies to encourage children to try new foods. The interventions in this tier are suggested for use with those having mild feeding difficulties or children that may develop feeding difficulties in the future based on current behavior. Mild feeding difficulties would mean the child exhibits few or no refusal behaviors during mealtimes and may try a new food occasionally when it is offered, but gets enough food currently to be considered healthy and thriving by a medical doctor. There is research to support the use of food choice, peer modeling, repeated taste exposure and token reinforcement in the school setting to increase healthy food consumption in typically developing children (Hendy, 2002; Hendy et al., 2005). At this time there is no known research that has used the intervention components in a school setting for a group of children that include children with ASD. In this global tier, parents, other caregivers,

and peers could model the behavior of trying new foods, provide enthusiastic praise when the child with ASD chews and swallows a bite of new food, not removing the new food from if child says "no'" to eating it or exhibits refusal behaviors, such as pushing the plate away or closing their mouth, but also not holding the food to the child's mouth, or re presenting the food if the child spits it out. The Premack Principle could be used in this tier also, where the parent or caregiver states to the child, "first you eat _____ (the non-preferred food), then you can have _____ (a favorite or highly preferred food)." This global tier is meant to be a proactive measure attempting to prevent feeding difficulties altogether, or prevent the feeding difficulties from worsening.

The second tier, a more specialized tier, would include children that did not respond well to interventions in the global tier, whose feeding difficulties have worsened, decreasing the amount and variety of food they were eating, or who are exhibiting more active refusal behaviors. When children are grouped in this tier, it is important to rule out medical causes as the reason for the feeding difficulty. If it is determined that the primary cause for the feeding difficulty is medical, the medical issues must be resolved first and consultation with a medical professional should be recommended before implementing the more specialized behavioral feeding interventions. In this tier, the most intensive interventions would not be implemented, but care would be taken by the professional and the parents/caregivers to not negatively reinforce the feeding difficulty. This may be difficult for some caregivers, so it is suggested there be assistance by a behavior feeding specialist and/or a Board Certified Behavior Analyst (BCBA) when implementing these procedures. Some procedures suggested for use with children in this tier of the feeding difficulties pyramid are use of high-p request sequences, taste sessions with exit criterion, positive reinforcement, and token systems, procedures that can be used in a small

group or family type setting (Williams & Foxx, 2007). Conducting a functional analysis or a functional behavior assessment to determine the function of the behavior, could be beneficial in this tier.

Children that initially present with more severe feeding difficulties or that do not respond to the interventions in Tier one or Tier two would be grouped in the third tier, the intensive treatment tier. Again, if a medical evaluation has not been conducted in the past for this child, one should be conducted first to rule out medical reasons as the primary cause for the child's feeding difficulty. If there is a medical reason for the feeding difficulty that needs to be resolved before the intensive behavioral interventions are implemented. Ongoing consultation with the medical professional is recommended throughout the intensive intervention if the primary cause of the feeding difficulty is medical. If a child is placed in this tier of feeding difficulties and feeding interventions, it is likely that more refusal behaviors may be seen, or that the intensity of the refusal behavior will be greater. Conducting a FBA or and FA in this tier to determine, if not previously conducted, should be mandatory. If the refusal behaviors have an escape function, escape prevention procedures and differential reinforcement would likely be implemented in this tier to remediate the feeding difficulties, however this could be used in conjunction with other procedures such as self monitoring with escape prevention procedures, dependent on the individual needs of the child.

Tier one and Tier two interventions can possibly be implemented in home and school settings, but if the feeding difficulties persist, children must be referred to a specialist for the intensive types of interventions that are included in Tier three. Research is needed to determine the feasibility and the accuracy of implementing the interventions as described in the tiers, as well as accuracy of describing and placing children with feeding difficulties into these tiers of

behavioral feeding interventions. Currently and with the possible implementation of the three tiers of feeding, there is also the question of accessibility for the children and families to services and professionals that are educated and trained in behavioral feeding difficulties and treatments. How do we as professionals working with children with ASD provide services to increase food acceptance and then provide method and interventions to sustain the gains made in food acceptance across settings and how do we make sure all children may have access to this? Future research should address these questions.

Practical Relevance

With these estimated high percentage of children with ASD having feeding difficulties there is a need for assessment and treatment of feeding and at a young age because of the potential future health risks (Ledford & Gast, 2008). There is a multitude of research addressing feeding difficulties in all children and an increasing number of research (Patel et al., 2006) addressing feeding difficulties in children with ASD, commonly the research has been conducted in the clinic setting with some research addressing feeding difficulties in the home. Little research has examined addressing feeding difficulties for children with ASD in the school setting. There is a need to find acceptable and sustainable interventions to support increasing and maintaining food acceptance across all environments.

The results of this present study suggests the use of high-p requests sequences may be an effective, acceptable, and sustainable intervention to use in the school setting. Despite these positive findings, much still needs to be investigated; whether the school environment is a proper environment to remediate feeding difficulties, or whether it more appropriate to train the teachers methods to support feeding intervention that were initially implemented in other environments. It is difficult to ascertain from the results of the study whether the high-p interventions are more

effective for children whose food refusal is maintained more by positive reinforcement. There are many questions left unanswered by the results of the current study and these questions should be addressed in future research; however the preliminary results from this study suggest the use of high-p request sequences may be a way to support increasing food acceptance for children with ASD in the school setting for some children.

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Appendix A

PROCEDURAL FIDELITY

Session _____
Mark yes for 80% of the times or more
Procedural Fidelity for Feeding Study

Implementer:_____ **Your Initials:**_____
Date: _____ **Child:**_____

Materials:

1. (FRT only) Are the cup, plate and bowl out and on the table? Y N
2. Is the low-p/food placed on a plate away from the child? Y N

Intervention:

1. Did the researcher say, "we are now going to begin?" (or something similar) Y N
2. Did the researcher give the High-p requests in rapid succession? (within 3-5 seconds after the last request) Y N
3. Did the researcher praise the student for complying to a high-p request? Y N
4. Did the researcher give the low-p request to take a bite of non-preferred food within 5 seconds of delivering the last high-p request? Y N
5. Did the researcher give enthusiastic praise ("you took your bite, great work, I love how you ate new food, super!") for complying with the low-p request (taking a bite of non preferred food)? Y N NA

Score: _____% fidelity (# Yes ___/total number of scored items)

Appendix B

SOCIAL VALIDITY

Teacher Questionnaire

Please rate on a scale of 1-5 whether you disagree, agree, or have a neutral opinion. Please return to Marissa Congdon.

1. The target behaviors of increasing food acceptance were important to address with this student?

   1 2 3 4 5

   disagree neutral agree

2. The interventions (high probability request sequences, food related and non-food related requests) were suitable for the school setting.

   1 2 3 4 5 N/A

   disagree neutral agree

3. The interventions were effective in increasing food acceptance in the school setting.

   1 2 3 4 5 N/A

   disagree neutral agree

4. In the future you would use a similar feeding intervention in the school setting for another child that is a picky eater.

   1 2 3 4 5

   disagree neutral agree

Comments:

Appendix C

DATA COLLECTION SYSTEM

Example:					
Request	**Date**	**Date**	**Date**	**Date**	**Date**
	5/10/13 FR	5/10/13 NFR	5/14/13 NFR	5/14/13 FR	
"Take a bite"	++++	+++++	---- +++	---+---++	

Appendix D

FOOD LIST

Child's Name: _____	List of Foods

In the first column please put the names of food your child currently eats. In the second column please put the name of the foods you would like your child to learn to eat. Once you complete the list of foods, please sign below to verify that your child has no allergy to any of the foods on the list and return this list to the DATA classroom teacher. Thank you.

List of foods your child currently eats	List of food you would like your child to eat

_____

PRINTED NAME OF PARENT/GUARDIAN SIGNATURE DATE

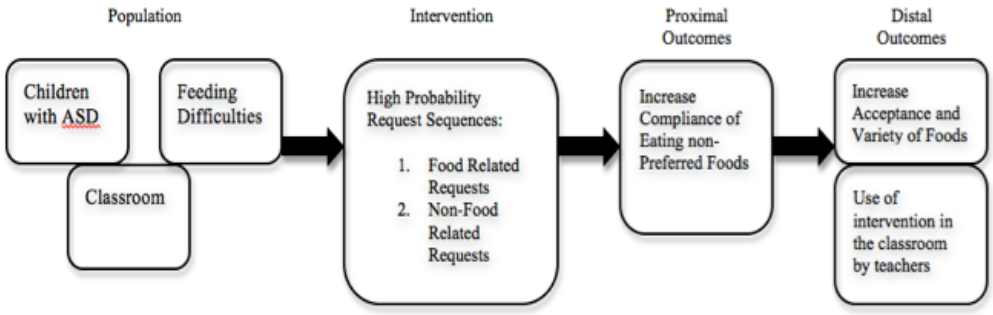

Figure 1. Theory of Change

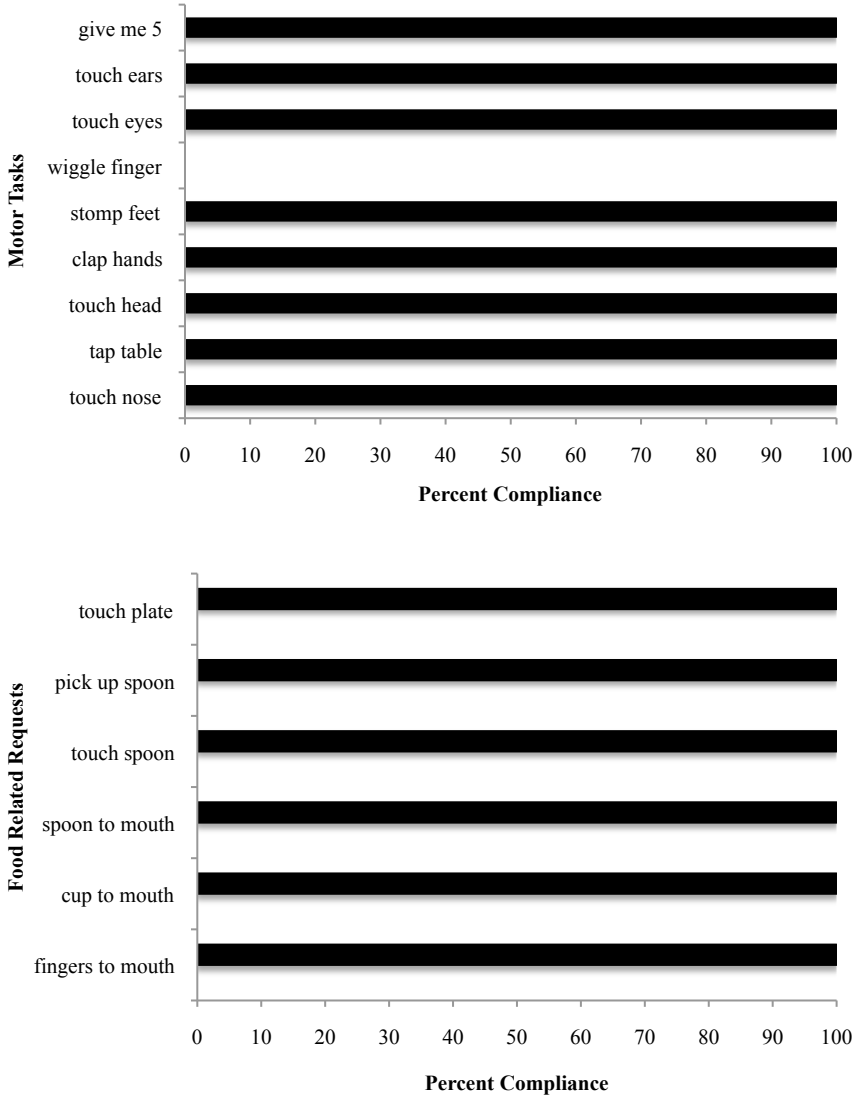

Figure 2. Percentage of compliance to high-p non food related (motor task) requests in the compliance assessment for Greg (top panel), and percentage of compliance to high-p food related requests (bottom panel).

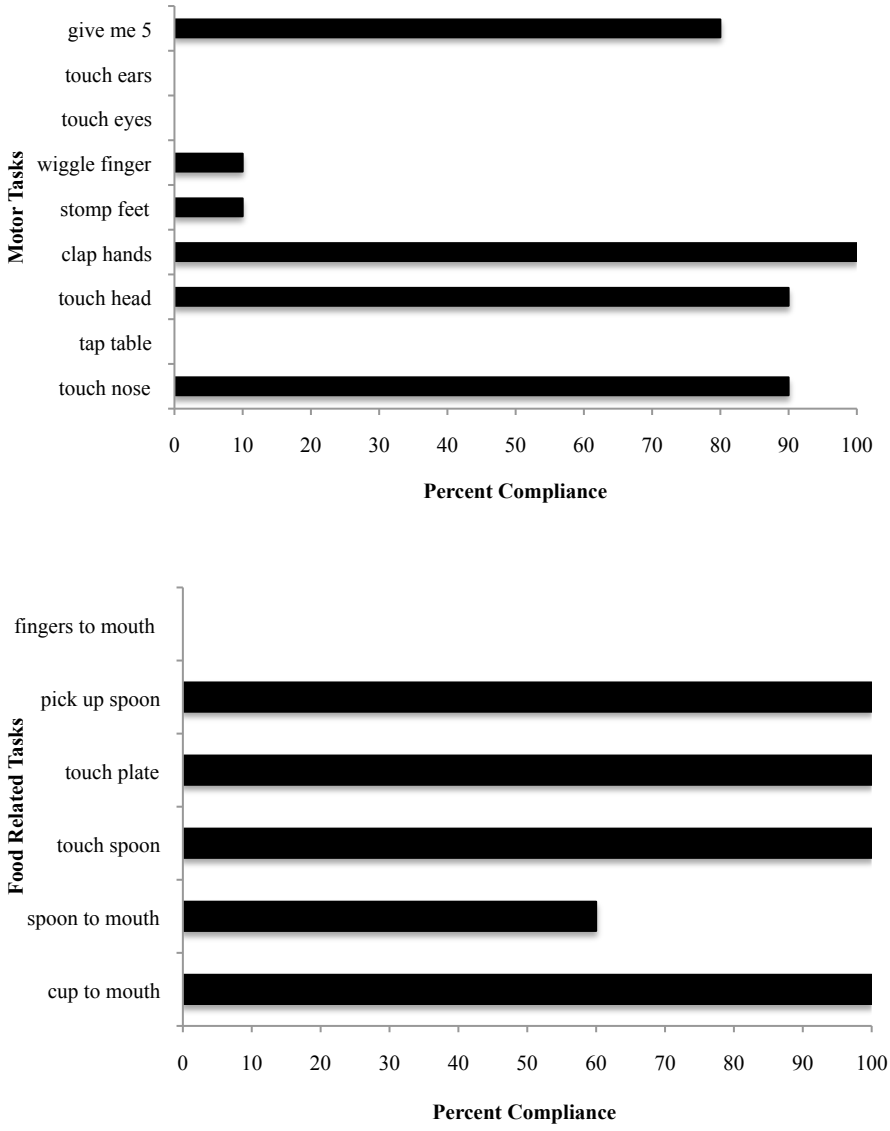

Figure 3. Percentage of compliance to high-p non food related (motor task) requests in the compliance assessment for Helena (top panel), and percentage of compliance to high-p food related requests (bottom panel).

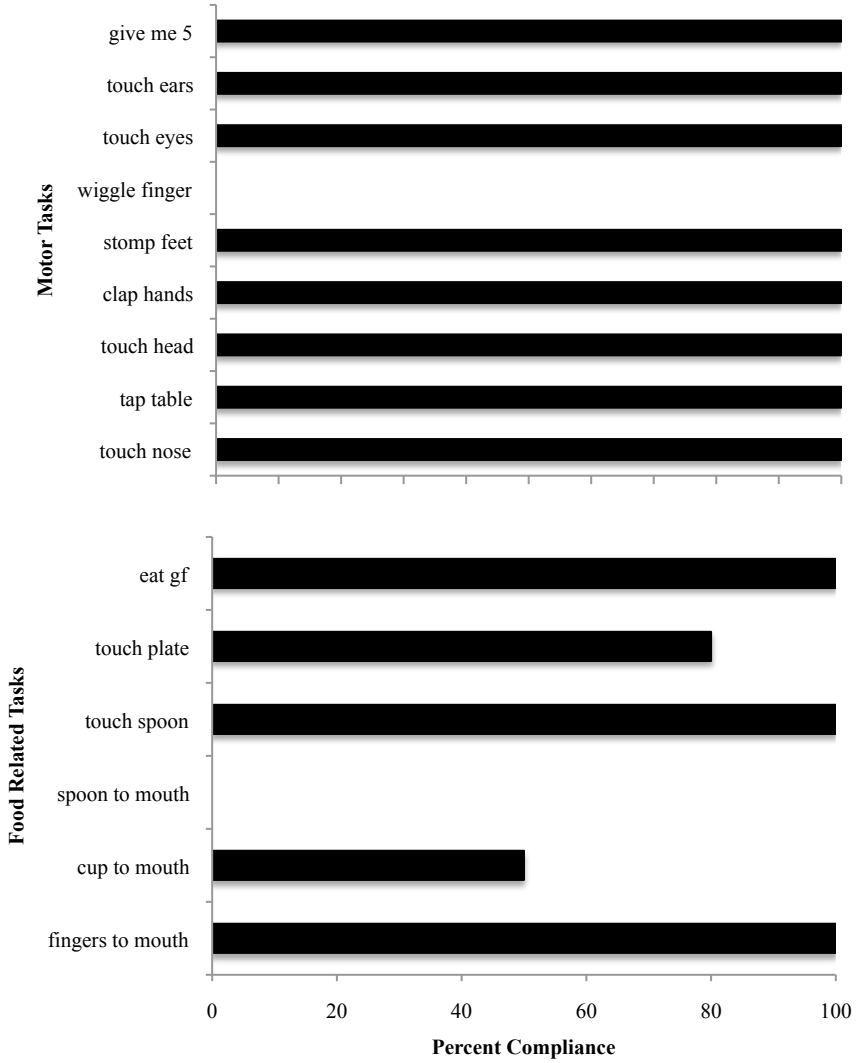

Figure 4. Percentage of compliance to high-p non food related (motor task) requests in the compliance assessment for Dexter (top panel), and percentage of compliance to high-p food related requests (bottom panel).

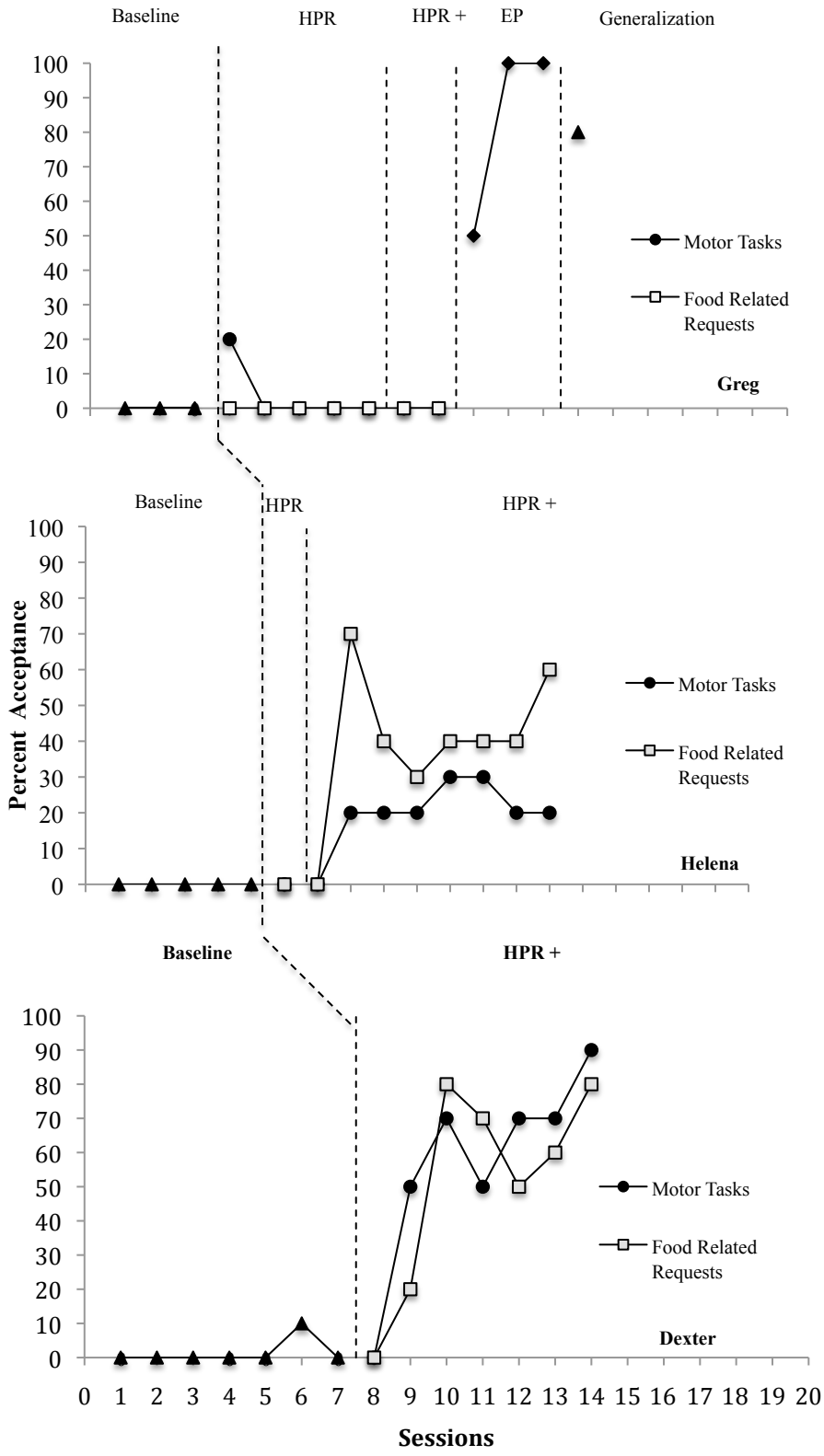

Figure 5. Percentage of acceptance of foods (low-p tasks) across sessions. EP= escape prevention procedures; HPR= high-p request sequence intervention; HPR + = high-p request enhanced interventions.

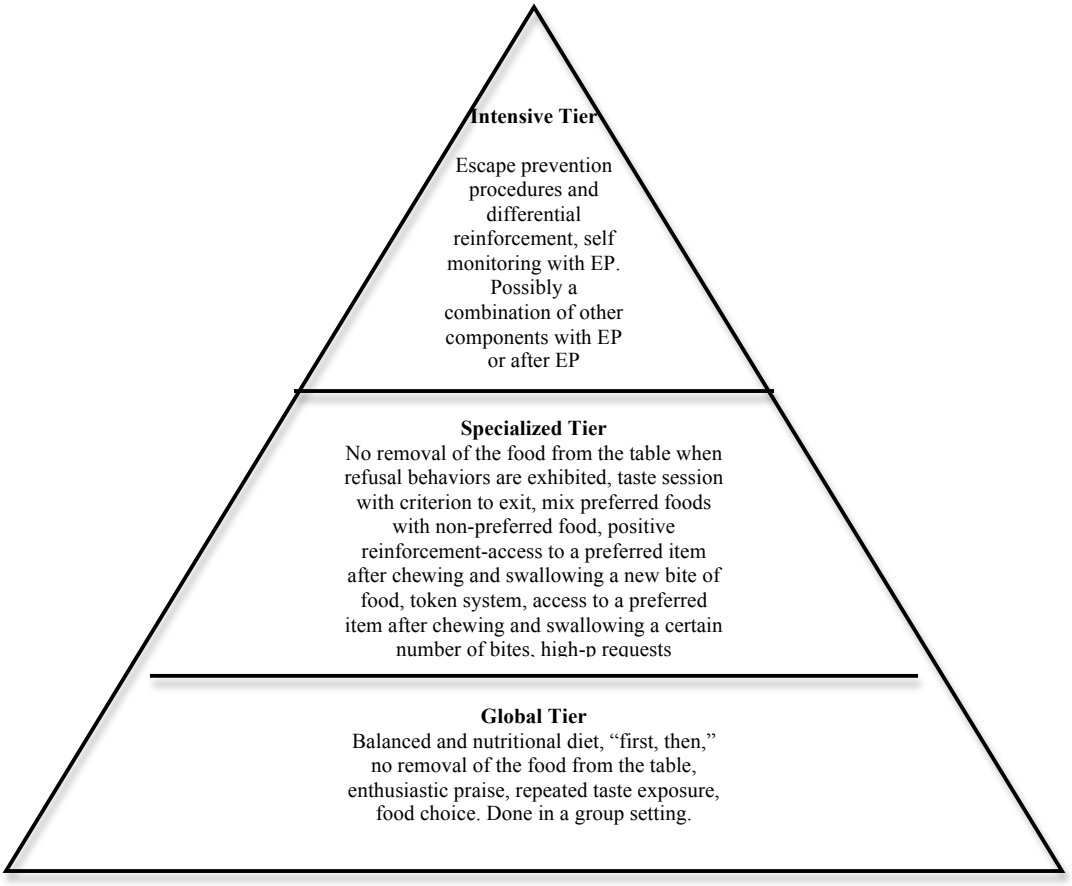

Figure 6. Three tiered feeding interventions for children with ASD, tiered feeding treatments.

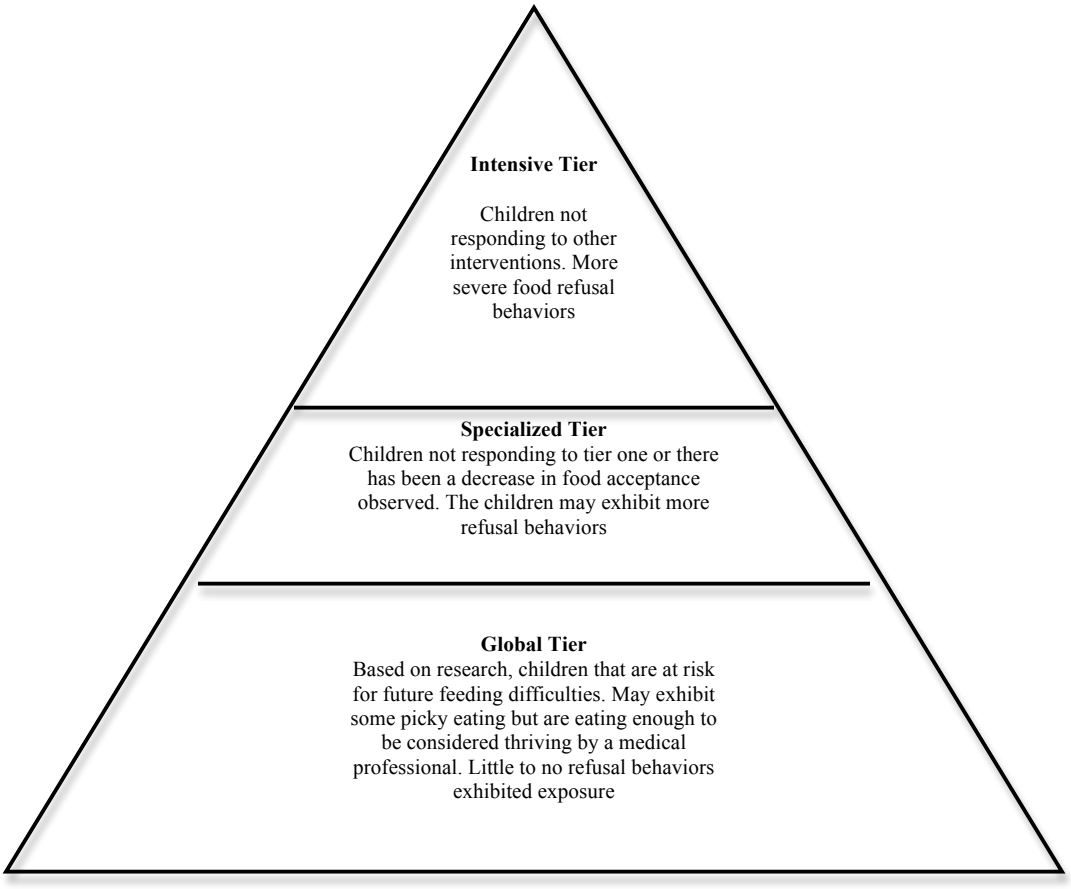

Figure 7. Three tiered feeding interventions for children with ASD, placement of children.

Table 1

Feeding Research, Procedures, and Setting

Articles	**Intervention Components**							**Setting**		
	EPP	Rein	HPR	AM	SF	DF	SSP	Home	Clinic	School
Dawson et al., 2003	✓	✓	✓						✓	
Hoch et al., 1994	✓	✓							✓	
Kelly et al., 2003		✓							✓	
Levin & Carr, 2001		✓		✓					✓	
Meier et al., 2012		✓	✓					✓		
Patel et al., 2006	✓	✓	✓						✓	
Patel et al., 2007	✓	✓	✓						✓	
Patel et al., 2002	✓	✓		✓			✓		✓	
Piazza et al., 2003	✓	✓							✓	
Penrod et al., 2012		✓	✓			✓			✓	
Rivas et al., 2010	✓	✓			✓				✓	

Note: EPP= escape prevention procedures. Rein=Reinforcement. HPR= High-p request sequences. AM= Appetite Manipulation. SF= Stimulus Fading. DF= Demand Fading. SSP= Simultaneous and Sequential Presentation.