EVALUATION OF A PARENT IMPLEMENTED INTERVENTION FOR FOOD SELECTIVITY IN CHILDREN WITH AUTISM

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ABSTRACT

Food selectivity is a common problem in many children with Autism Spectrum Disorder (ASD). While research into this area is beginning to develop, there are currently few studies investigating the use of parent-implemented interventions within this population. The present study aimed to teach parents to implement multi-component behavioural interventions at home to ameliorate the food selectivity of their children. The study also aimed to show that these interventions could increase children's preference for previously nonpreferred foods. Five children and their parents participated. The interventions delivered to the children were tailored to meet their needs and to fit within the context of their families. Each of these interventions was composed of antecedent, positive reinforcement and escape extinction strategies. Parents recorded their children's food acceptance and disruptive behaviours during each intervention session. In addition, preference assessments were conducted in order to track changes in the children's preferences for the target foods. The results showed that all of the parents were able to introduce at least one new food to their children's diets during the intervention. Further, four of the five children showed an improvement in their preference for the targeted foods. These results were maintained at follow-up, although two of the children had only maintained some of the foods that had been introduced. All of the parents reported that their children consumed more foods at follow-up than they had during baseline and indicated that they thought the interventions had been effective. These results indicate that parents are able to implement multi-component behavioural interventions to increase the range of foods in their children's diets and improve their children's preference for these foods.

CHAPTER 1

INTRODUCTION

Autism Spectrum Disorder (ASD) is a developmental disorder which is characterised by impairments in communication, socialization and restricted or repetitive patterns of behaviour. It is often associated with a range of co-morbid behaviour problems such as inattention, hyperactivity, aggression, impulsivity, temper tantrums and self-injurious behaviour (American Psychiatric Association, 2000). Feeding problems also commonly co-occur, with between 46% and 89% of children with ASD displaying unusual patterns of food consumption (Ledford & Gast, 2006). These include problems such as overeating, food cravings, pica, idiosyncratic meal time behaviour, food refusal and food selectivity (Gillberg & Billstedt, 2000; Schreck, Williams & Smith, 2004). Studies which describe effective interventions for addressing food selectivity in children with ASD have begun to accumulate. However, there is a relative dearth of studies investigating the use of parent-implemented interventions for this population.

Food Selectivity

Mild feeding problems are not uncommon in young children (O'Brien, Repp, Williams & Christophersen, 1991). Most children naturally become pickier eaters at around the age of two years (Berk, 2006). Young children are more likely to refuse to eat new foods the first time they are presented with them and tend to prefer foods that they are familiar with (Birch, 1999; Birch & Marlin, 1982). Generally, feeding problems in this population dissipate over time. However, 2% - 35% of typically developing children and 33% - 80% of children with developmental disabilities develop severe feeding problems (Bachmeyer, 2009).

One such feeding problem is food selectivity. Children with food selectivity severely restrict the range of foods in their diets (Tarbox, Schiff & Najdowski, 2010). These children are sometimes described as 'picky' eaters who only eat certain foods from some food groups, refuse to eat foods from whole food groups, or who are extremely selective about certain tastes, textures, temperatures, presentations or brands (Bachmeyer, 2009; Gentry & Luiselli, 2008; Levin & Carr, 2001; Shore, Babbitt, Williams, Coe & Snyder., 1998). Often, such children will refuse to try all novel foods

(Levin & Carr, 2001). Further, they tend to frequently engage in high levels of disruptive behaviours during mealtimes (Sanders, Patel, Le Grice & Shepherd, 1993).

Food Selectivity in Children with ASD

Food selectivity is one of the most commonly occurring feeding problems in children with ASD (Laud, Girolami, Boscoe & Gulotta, 2009). It occurs more often in these children than it does in typically developing children (Bandini et al., 2010; Matson, Fodstad & Dempsey, 2009) or children with other developmental disabilities (Fodstad & Matson, 2008). Other types of feeding problems such as food refusal, dysphagia and oral motor issues are less common in children with ASD compared to children with other developmental disabilities (Field Garland & Williams, 2003).

Many children with ASD eat a limited range of foods and accept fewer foods from all the food groups (Schreck & Williams, 2006). While there is disparity in reports regarding which food groups most of these children selectively eat, several studies have found that none of their participants showed selective consumption of vegetables (Ledford & Gast, 2006). A study by Cornish (1998) showed that of 17 children with ASD, 59% consumed fewer than 20 foods and 18% consumed fewer than eight foods. Further, 35% of the children consumed no meats or meat products, 18% ate little or no dairy and 94% failed to eat the recommended number of daily fruits and vegetables.

While it is clear that food selectivity is frequently present in children with ASD, there is disagreement about the extent to which it affects their health. Some researchers have found that children with ASD show no significant difference in nutritional status when compared to typically developing peers (e.g. Johnson, Handen, Mayer-Costa & Sacco, 2008). Other studies claim that feeding problems in these children are related to poor growth (Keen, 2008) or that while normal growth may be maintained, an adequate variety of foods is not consumed to support sufficient nutrient intake (Bandini et al., 2010; Bowers, 2002). Severe feeding problems can lead to a range of negative outcomes, including malnutrition, weight loss, poor health, and impaired physical or cognitive development (Bandini et al., 2010). Even in cases where food selectivity is not life-threatening, it may still have negative consequences for children and their families. The families of children with feeding problems are at greater risk of increased stress, mental health issues, and health costs (Piazza & Carrolll-Hernandez, 2001; Timimi, Douglas & Tsiftsopoulou, 1997).

Causes of Food Selectivity in Children with ASD

Several theories exist regarding the cause of food selectivity in children with ASD. The most popular of these theories can be divided into three broad categories: core characteristics of ASD, physiological factors and environmental factors. It is extremely difficult to isolate a single causal factor for food selectivity. It is more likely to arise as a result of a combination of several factors.

Core characteristics of ASD: A common theory about the cause of food selectivity in children with ASD is that it develops as a result of the characteristics associated with the disorder (Ahearn, Castine, Nault & Green, 2001). Many of the behaviours frequently associated with food selectivity such as insisting on particular mealtime rules, utensils and food presentations may simply be extensions of one of the core features of ASD: restricted interests and repetitive behaviours (Twachtman-Reilly, Amaral & Zebrowski., 2008). Other common characteristics which may affect feeding problems include a tendency toward perseveration, adherence to routines, fear of novel stimuli, impulsivity, sensory deficits, social problems and extreme attention to detail (Ledford & Gast, 2006).

This theory is widely regarded and frequently cited in studies of food selectivity in children with ASD (e.g. Fodstad & Matson, 2008; Ledford & Gast, 2006; Twachtman-Reilly et al., 2008). However, it was not supported in a study by Schreck and Williams (2006). They conducted a multiple regression analysis to discover whether severity of ASD symptoms as measured by the Gilliam Autism Rating Scale (GARS: Gilliam, 1995, cited in Schreck & Williams, 2006) or family food preferences predicted child food preferences. They found that while there was a relationship between the children's food preferences and their family's food preferences, there was no significant relationship between the children's food preferences and their GARS scores. This result is surprising in light of the popularity of this theory. More research needs to be undertaken to investigate the relationship between food selectivity and the characteristics of ASD.

Physiological factors: A second theory is that physiological problems contribute to the development of food selectivity in children with ASD. One physiological factor which has been implicated is gastrointestinal problems. Gastrointestinal problems include constipation, diarrhoea, gastroesophageal reflux and other symptoms caused by food allergies (Twachtman-Reilly et al.,

2008). It is possible that the discomfort caused by some foods may cause children to be unwilling to eat them or even to eat larger categories of foods (Matson & Fodstad, 2009).

There is much debate regarding the presence of gastrointestinal problems in children with ASD. Some studies claim that these problems are more prevalent in children with ASD than in typically developing children (Horvath, Papadimitriou, Rabsztyn, Drachenberg, & Tildon, 1999; Jyonouchi, Geng, Ruby, Reddy & Zimmerman-Brier, 2005) while others claim that there is no difference between the two populations (Black, Kaye & Jick, 2002). However, one study (Williams, Dalrymple & Neal, 2000) showed that children who had ASD and gastrointenstinal problems were more likely to have poor appetites than children with ASD and no gastrointestinal problems. This suggests the possibility of some relationship between gastrointestinal problems and food selectivity.

Deficits in sensory processing are another physiological problem common to children with ASD (Bennetto, Kuschner & Hyman, 2007; Iarocci & McDonald, 2006). These sensory deficits could contribute to feeding problems in different ways. For example, a child who is hypersensitive to gustatory stimuli (tastes) might become a 'picky' eater, frequently gag, refuse foods or prefer mild foods. A child who is hypersensitive to tactile stimuli might frequently refuse to eat, prefer mild temperatures and dislike the feel of food around the mouth (Twachtman-Reilly et al., 2008). Some researchers have found a relationship between sensory processing problems and feeding problems of children with ASD. Nadon, Feldman, Dunn and Gisel (2011) found that children with ASD who had sensory problems were likely to have more feeding problems than those without sensory issues. They also found that children with ASD and taste or odour sensitivity had marked food preferences. This suggests that the sensory processing deficits of children with ASD may put them at increased risk for feeding problems.

Environmental factors: A third theory is that environmental factors also affect the development of food selectivity in children with ASD. One influential environmental factor is parent behaviour. Piazza, Fisher et al. (2003) found that the parents of children with feeding problems often use methods such as coaxing, reprimanding, giving breaks, and distracting children during meals. These strategies were found to exacerbate feeding problems in a majority of children. Parents of children with feeding disorders have also been found to engage in more coercive parenting strategies

(such as aversive verbal statements) at mealtimes than parents of children without feeding disorders (Sanders et al., 1993). It is possible that ineffective parenting strategies such as these are reinforced when children sporadically consume the foods, thereby increasing the likelihood of further parental coercion. Other family environmental factors that may contribute to feeding problems include exposure to developmentally inappropriate textures (e.g. remaining on pureed food), lack of structure around meal times, and parental modelling of poor eating behaviours (Sharp, Jaquess, Morton & Herzinger, 2010). Schreck and Williams (2006) found that the diets of children with ASD reflected those of their parents, in that parents who had restricted diets typically had children with restricted diets.

Mismanagement of behaviour is widely believed to contribute to the development and maintenance of children's feeding problems (Palmer, Thompson & Linscheid, 1975; Piazza, Patel, Gulotta, Sevin & Layer, 2003). One way that this might occur is through the negative reinforcement of food refusal (Sharp et al., 2010). An example is when a caregiver responds to a child's refusal to eat by ending the meal or by removing nonpreferred foods. When the child's refusal results in being allowed to escape or avoid the nonpreferred food items, the likelihood that refusal will occur the next time the food is offered is increased. In one study, the feeding problems of 90% of children were found to be maintained by negative reinforcement (Piazza, Fisher et al., 2003). Conversely, food selectivity may also develop and be maintained through positive reinforcement. This may occur if parents give the child attention or provide a preferred food when the child refuses to eat non-preferred foods (Freeman & Piazza, 1998). This kind of parent response positively reinforces food refusal and increases the likelihood that the child will reject the non-preferred food in the future.

Interventions for Food Selectivity

It is important that studies investigate effective interventions for food selectivity in children with ASD. Many researchers believe that the food selectivity of this population is maintained by environmental contingencies or is sensory-based in nature (Fodstad & Matson, 2008) while the feeding problems of children without ASD are more likely to arise as a result of medical or organic factors (Schwarz, 2003). Further, characteristics common to children with ASD (such as difficulty with mental flexibility and repetitive behaviours) may make them particularly resistant to therapeutic

change (Twachtman-Reilly et al., 2008). This means that while research into the food selectivity of children without ASD is helpful, it may not necessarily generalize well to children with ASD (Ledford & Gast, 2006).

Behavioural interventions have gained much empirical support in the treatment of children's feeding problems (Ahearn, 2002; Bachmeyer, 2009; Greer, Gulotta, Masler & Laud., 2008; Piazza & Carroll- Hernandez, 2004; Sharp et al., 2010). Some studies suggest that behavioural methods are more effective than other methods. For example, Benoit, Wang and Zlotkin (2000) found that children with feeding problems who received behavioural treatment and nutritional intervention showed greater improvement than children who received nutritional intervention alone. A variety of behavioural methods have been developed to treat feeding problems. These include positive reinforcement strategies, escape extinction strategies and antecedent strategies.

Positive Reinforcement Strategies

Positive reinforcement strategies are often used in the treatment of food selectivity. These strategies involve delivering rewarding stimuli when a desired behaviour has been executed in order to increase the rate of that behaviour (Ledford & Gast, 2006). Interventions addressing feeding problems using positive reinforcement usually involve giving the child a rewarding food, token, toy or praise for eating targeted foods (Bachmeyer, 2009). Differential reinforcement and noncontingent reinforcement are both positive reinforcement strategies that have been used in interventions addressing food selectivity.

Differential reinforcement: Differential reinforcement involves positively reinforcing the child's desirable behaviour while removing reinforcement for undesirable behaviour (Ledford & Gast, 2006). An example of this might be making access to a preferred food or toy available only after a portion of nonpreferred food has been eaten. This is one of the most widely used techniques in studies addressing food selectivity in children with ASD (e.g. Ahearn, 2002; Ahearn, Kerwin, Eicher & Lukens, 2001; Binnendyk & Lucyshyn, 2009).

Noncontingent reinforcement: Noncontingent reinforcement is a strategy where preferred stimuli (e.g. toys and activities) are continually present throughout the meal (Bachmeyer, 2009). That is, the delivery of the preferred stimuli is not contingent on consumption of the target food, but is

readily available to the child at any time during the meal. Wilder, Normand and Atwell (2005) found that noncontingent reinforcement alone was effective in reducing the self-injurious behaviours and increasing the food consumption of a three year old girl with Autism.

Strengths and Limitations of Positive Reinforcement Strategies

Positive reinforcement techniques may be particularly useful in interventions for food selectivity in children with ASD for several reasons. The first is that they are likely to increase the child's compliance and engagement with treatment (Kozlowski, Matson, Fodstad & Moree, 2011). This is important because children with ASD are often unable to motivate themselves to acquire new skills as they do not have the insight required to see why they should do so (Kozlowski et al., 2011). In addition, the use of positive reinforcement strategies may reduce the likelihood that the child will engage in disruptive behaviours (Reed et al., 2004). It is possible that this may in turn increase the parents' engagement in interventions.

Another advantage of using positive reinforcement strategies is that they may influence parent-child mealtime interactions. This is important as these interactions have been suggested to contribute to the maintenance of food selectivity (Timimi et al., 1997). Parents frequently express concern over the impact of their children's food selectivity which may affect the way they behave towards them during meals (Williams, Gibbons & Schreck, 2005). Interventions with positive reinforcement strategies may teach parents to interact more positively with their children (O'Brien et al., 1991).

One problem with positive reinforcement techniques is that the highly preferred foods frequently used as reinforcers are often nutritionally poor (Bachmeyer, 2009). This may reduce the acceptability of the intervention to parents or teachers who have to implement the strategy. However, it is possible for a preferred food to be gradually faded out by increasing the amount of non-preferred food that the child is required to consume before accessing reinforcement (Riordan, Iwata, Wohl & Finnery, 1980). Eventually the reinforcer may be faded out altogether.

Another limitation is that positive reinforcement techniques may not directly address the function of children's food selectivity (Ahearn, Kerwin, Eicher, Shantz & Swearingin, 1996). In order to be effective, the reinforcing stimuli must compete with the contingencies that maintain the feeding

problem, such as negative reinforcement of avoidance behaviours (Piazza et al., 2002). That is, if the reinforcing stimulus is not sufficiently motivating, the child may simply continue to avoid eating nonpreferred foods. If this happens, the child may not have the opportunity to contact the reinforcement contingency (Hoch, Babbitt, Coe, Krell & Hackbert, 1994) and so will not increase his or her food consumption. This limitation has been supported by some studies that have found that positive reinforcement techniques were only effective when used in conjunction with escape extinction techniques (Piazza, Patel et al., 2003, Reed et al., 2004).

Escape Extinction Strategies

Escape extinction involves stopping the child from escaping the demand of eating non-preferred foods and thereby preventing food refusal from being negatively reinforced (Ledford & Gast, 2006). Examples of escape extinction strategies include nonremoval of the spoon, nonremoval of the meal, representation and physical guidance.

Nonremoval of the spoon: During nonremoval of the spoon, a spoonful of food is held up to the child's lips. The food is inserted as soon as the child opens his or her mouth, whether it is to talk, cry or accept the food (Ahearn et al., 1996). This prevents the child from escaping the demand of eating the nonpreferred food. Several studies have demonstrated the effectiveness of this technique (Ahearn, Kerwin et al., 2001; Piazza, Patel et al., 2003).

Nonremoval of the meal: During nonremoval of the meal, the child is required to finish his or her meal before leaving the table. In doing so, the child is prevented from avoiding the nonpreferred foods and so is no longer negatively reinforced for refusal to eat. This strategy is commonly used by parents but has yet to be extensively researched (Tarbox et al., 2010).

Representation: Representation is a strategy for addressing food expulsions. Each time the child expels a nonpreferred food (i.e. spits it out) a new spoonful of the same kind of food is presented in its place. This strategy is frequently included as part of escape extinction interventions (e.g. McCartney, Anderson & English, 2005; Paul, Williams, Riegel & Gibbons, 2007).

Physical guidance: Physical guidance involves guiding the spoon to the child's mouth and assisting the mouth to open by pressing gently on his or her chin. The effectiveness of this strategy has also been demonstrated in the literature (Ahearn, Kerwin, et al., 2001).

Strengths and Limitations of Escape Extinction Strategies

The effectiveness of escape extinction strategies in ameliorating children's feeding problems has been well documented (Piazza, Patel et al., 2003). This, perhaps, is unsurprising given that the feeding problems of most children are maintained by the negative reinforcement of escape behaviours (Piazza, Fisher et al., 2003). Escape extinction strategies directly address the function of these behaviours. These procedures have been shown to be effective even in the absence of positive reinforcement (Piazza, Patel et al., 2003). This indicates that escape extinction strategies may be an essential component of interventions addressing food selectivity in children with ASD.

However, there are some crucial limitations associated with the use of escape extinction. Many studies involving escape extinction procedures have used invasive methods for doing so. The use of invasive methods with children with ASD has yet to be thoroughly researched (Ledford & Gast, 2006). Techniques such as physical guidance, particularly when forcing a child's mouth open, may risk causing pain, injury or resistance (Gentry & Luiselli, 2008). Further, the use of escape extinction procedures can produce aggression, emotional distress and extinction bursts, where inappropriate behaviours temporarily increase (Ahearn et al., 1996).

Parents and community practitioners may find escape extinction methods difficult or aversive to implement consistently (Bachmeyer, 2009; Kerwin, 1999). Anecdotally it has been reported that parents find strategies like nonremoval of the spoon distressing to watch and difficult to use (Tarbox et al., 2010). This may mean that some escape extinction procedures are not appropriate for interventions delivered by parents. Less intrusive escape extinction methods such as nonremoval of the meal may be more appropriate, but currently there is little research investigating this possibility.

Antecedent Strategies

Antecedent strategies are those which are put in place before problem behaviours (such as food refusal) have occurred. They are often included in multi-component packages treating food selectivity (Sharp & Jaquess, 2009). Antecedent strategies which have been used in research to treat feeding problems include behaviour shaping, behavioural momentum, simultaneous presentation, stimulus fading (by type, texture and amount), limited access to preferred foods, and repeated taste exposure.

Behaviour shaping: Behaviour shaping involves teaching the child to consume nonpreferred foods by targeting behaviours that successively approximate eating the food (Binnendyk & Lucyshyn, 2009). For example, the child may be required initially to tolerate nonpreferred foods touching his or her lips, then being placed inside the mouth and finally chewing and swallowing the food. Although behaviour shaping has not been extensively studied as a means of addressing food selectivity in children with ASD, it has been reported by parents to be successful (Ledford & Gast, 2006).

Behavioural momentum: Behavioural momentum, also known as high-probability instructional sequencing, is a procedure where several high-probability commands (which are very likely to be complied with) are delivered immediately before a low-probability command (which is less likely to be complied with) (Bachmeyer, 2009). This procedure is based on the idea that the child will be more likely to comply with a low-probability command (such as eating a nonpreferred food) after following a series of high-probability commands (such as placing an empty spoon in his or her mouth). While this procedure has been used to increase compliance in other areas, its use in addressing the food selectivity of children with ASD has been little studied (Ledford & Gast, 2006).

Simultaneous presentation: Simultaneous presentation is a strategy where non-preferred foods are delivered at the same time as preferred foods. The non-preferred foods may be blended with or hidden inside preferred foods, or delivered to the child on the same spoon (Bachmeyer, 2009). Some studies have demonstrated the effectiveness of this approach (e.g. Ahearn, 2003; Kern & Marder, 1996; Piazza et al., 2002). The strategy is thought to work by producing a conditioned preference for the flavour of the nonprefered food (Piazza et al., 2002). However, some caution may be warranted. It is possible that pairing a non-preferred food with a preferred food may have the opposite effect and reduce the child's acceptance of the preferred food (Kerwin & Eicher, 2004).

Stimulus fading of food type: Stimulus fading of food type is a procedure that involves gradually altering the ratio of preferred foods with non-preferred foods. Initially a small amount of non-preferred food is mixed or presented with a preferred food. Over time, the amount of non-preferred food is slowly increased and the preferred food is slowly decreased. This gradual process may help to ensure that the preferred food does not take on the aversive qualities of the non-preferred food (Bachmeyer, 2009).

Stimulus fading of amount of food: Stimulus fading has also been used to target the amount of food eaten. Initially small portions of food are targeted, as children are more likely to try small volumes of food than larger volumes of food (Kerwin, Ahearn, Eicher & Burd, 1995). As the child's acceptance of this portion of food improves, the amount they are required to eat is gradually increased (e.g. Freeman & Piazza, 1998).

Stimulus fading of food texture: Texture fading involves progressively changing the ratio of food texture (Levin & Carr, 2001). This procedure has been used to treat texture aversions (Shore et al., 1998). Several studies have shown that altering the texture of nonpreferred foods can be an important component in the treatment of food selectivity in some children (Munk & Repp, 1994; Patel, Piazza, Santana & Volkert, 2002).

Repeated taste exposure: Repeated taste exposure is a strategy where nonpreferred foods are presented to the child on many occasions. Studies show that children are more likely to try and like foods after they had been exposed to them several times (Birch, 1999; Paul et al., 2007).

Limited access to preferred food: Limited access to preferred foods is a strategy where the child is prevented from eating any preferred foods prior to intervention. Limiting access to these foods may increase their effectiveness as reinforcers which can be delivered contingent on the consumption of targeted nonpreferred foods (Levin & Carr, 2001). The use of this strategy may motivate children to try nonpreferred foods and increase the effectiveness of a positive reinforcement based intervention.

Strengths and Limitations of Antecedent Strategies

Most empirical studies of food selectivity treatment in children with ASD have focussed on consequence strategies (Ahearn, 2003). Unfortunately, few studies have systematically investigated the effects of antecedent strategies. Antecedent strategies may represent an important component of the treatment of food selectivity in children with ASD. Manipulating antecedent variables (such as food texture or bite size) may reduce the aversive qualities of nonpreferred foods, and so promote food acceptance and reduce disruptive behaviours (Sharp & Jaquess, 2009). This may in turn help to prevent the need for intense escape extinction strategies (Levin & Carr, 2001). This notion was supported in a study by Patel et al. (2007) who demonstrated the effectiveness of behavioural

momentum without escape extinction to increase the food consumption of a boy with developmental delay.

Many studies of the treatment of feeding problems do not simply use one of the above techniques, but use several in combination (Ledford & Gast, 2006). The most commonly reported intervention for feeding problems combines positive reinforcement with escape extinction (Bachmeyer, 2009). It is important that interventions involve multiple components to address the antecedent, setting and consequence variables that frequently affect feeding problems in children (Binnendyk & Lucyshyn, 2009).

In order to identify the strategies which have been most commonly used to treat food selectivity in children with ASD, a review was undertaken of the interventions described in food selectivity research. Electronic and ancestral searches were used to identify relevant studies. A database search was conducted using EBSCO Host. A Google search was also used to identify the location of relevant studies. The keyword terms used included 'autism', 'autism spectrum disorder', 'pervasive developmental disorder', 'asperger's syndrome', 'feeding problems', 'food selectivity' and 'food refusal'. In order to be included in the review, the articles had to describe an intervention aimed at increasing food consumption and include children with ASD. Studies that did not contain an adequate description of the methods used were excluded. This literature review was initially conducted early in 2009 and then updated at the end of 2011. In total, eighteen studies evaluating interventions for food selectivity in children with ASD were identified. Fifteen of these interventions were implemented by trained therapists while only three were implemented by parents. Therapist-implemented interventions are displayed in Table 1 and parent-implemented interventions are shown in Table 2.

As can be seen in Tables 1 and 2, half of the studies involved a combination of reinforcement, escape extinction and antecedent strategies. Antecedent strategies were used in 83.3% of studies, while escape extinction and reinforcement strategies were used in 72.2% of studies. The most

Table 1.
Interventions for food selectivity in children with ASD implemented by therapists.

Study	Research Design	Methods	Duration	Participants	Food Consumption	Disruptive Behaviours	Follow-up
Ahearn, 2002	Changing criterion. Compared introduction of single vs. multiple food items	NRS, PG, DR	6 -20 sessions	6 children with Autism (4) and PDD-NOS (2). 4-11 years old.	Single group accepted foods fastest. Multi group showed more generalization. 12 foods introduced.	Acceptance criteria required <20% expulsion and <20% disruptions.	No follow-up
Ahearn, 2003	Multiple baseline across foods. Examined use of SP.	SP	38 sessions	14 year old boy with Autism	Consumption increased from 0-40% to 100%. 3 foods introduced.	No disruptive behaviours.	1 year: Reported to eat vegetables with condiments
Ahearn, Kerwin, et al., 2001	ABAC Compared use and of NRS and PG.	NRS, PG, LAF, Re, DR	50 sessions	4 year old boy with PDD-NOS	Consumption increased during PG and NRS relative to BL. Mean consumption highest during NRS.	Fewer disruptions during NRS than during PG.	3 months: 100% acceptance with NRS
Binnendyk & Lucyshyn, 2009	Single case study AB. Used Positive Behaviour Support approach to guide intervention.	DR, NRS, RTE, VA, BS, SF-A, SF-T, Re	39 therapist and 15 parent sessions	6 year old boy with Autism	Therapist sessions: consumption increased to 100% for 5 foods. Parent sessions: consumption increased to 64%. Introduced two foods during parent sessions.	Not recorded for parent sessions.	1, 5, 6 weeks and 2 years: Total consumption: 56% (self-initiated: 12%).
Freeman & Piazza, 1998	Multielement. Increased food consumption	SF-A, PP, PG, SF-T	12 weeks	6 year old girl with Autism	BL: 0% Treatment >50% Grams consumed increased from 0 to 150.	Reported disruptions remained low during treatment.	No follow-up
Kern & Marder, 1996	Multielement. Compared effects of SP and DR	NRS, Re, SP, DR	60 meals	7 year old boy with PDD	Mean consumption during SP was higher (85%) than mean consumption during DR (76%).	Fewer self injurious behaviours during SP than DR	No follow-up
Kozlowski et al., 2011	Changing criterion. multicomponent intervention.	NRS,DR, SF-T	14 sessions	9 year old boy with Autism	100% consumption of food across all treatment sessions.	Not reported.	1 year: Greater acceptance and fewer feeding problems.
Levin & Carr, 2001	ABCDAD multiple baseline. Analysed effects of LAF and DR.	DR, LAF, SF-A	30-45 sessions	4 children with Autism aged 5-7 years.	Little improvement shown until LAF used in combination with DR. 2 foods introduced.	Fewer disruptions during treatment than during BL.	No Follow-up

Table 1. *continued*.

Study	Research Design	Methods	Duration	Participants	Food Consumption	Disruptive Behaviours	Follow-up
McCartney et al., 2005	Changing criterion with a within-subjects replication across a 2nd food. Trained parents to use escape extinction.	DR, NRS, SF-A, Re	62-127 meals	3 boys with Autism aged 5 -7 years.	Acceptance increased to criterion amount in therapist and caregiver sessions. Two foods introduced.	Disruptions reduced and remain low during intervention.	1 month – 1 year: Generalization to other foods.
Patel et al., 2007	ABAB Investigated the effects of BM	BM	25 sessions	4 year old boy with PDD	Consumption increased from 0% to 100%. 3 foods introduced.	No disruption across all phases.	3 month: consumption remained high.
Paul et al., 2007	Single case study AB Examined effect of RTE	Re, NRM, SF-A, RTE	*Child 1*: 13 days *Child 2*: 15 days	5 year old girl with Autism 3 year old boy with Autism	*Child 1*: Acceptance increased to 69%. Introduced 49 foods. *Child 2:* Acceptance increased to 73%. Introduced 63 foods.	Disruptions dropped to less than 14% for child 1 and to less than 29% for child 2.	Child 1 maintained 47 food, Child 2 maintained 53 foods
Piazza et al., 2002	Multielement. Compared effects of SP and DR	SP, DR, Re, PG,	18-90 sessions	3 children with Autism or PDD, 8 – 11 years old.	SP was more effective than sequential presentation. 1 - 16 foods introduced.	Not reported	No follow-up
Sharp & Jaquess, 2009	ABCB for texture, AB for bite size. Used texture and bite-size assessments to guide treatment.	NRS, Re, NCR, SF-A, SF-Te	29 days (116 meals)	3 year old boy with Autism	Increased texture tolerance and bite size tolerance. Introduced 16 foods.	Disruptions increased initially but decreased with time	No follow-up
Wilder et al., 2005	ABAB. Investigated the effects of NCR.	NCR	6 sessions	3 year old girl with autism	Food acceptance increased during NCR conditions.	No expulsions. Self-injurious behaviours decreased during NCR.	No follow-up
Wood, Wolery & Kaiser, 2009	Multiple probes across foods. Targeted gluten/casein free diet	DR, PP, SF-T	28 sessions	5 year old boy with Autism	Food consumption increased. 4 new foods introduced.	Escape behaviours (leaving the table) increased.	No follow-up

BL = Baseline, NRS = Nonremoval of the spoon, PG = Physical Guidance, PP = Partial Physical Prompt, Re = Representation, SP = Simultaneous Presentation, SF-A = Stimulus fading of food amount, SF-T = Stimulus fading of food type, SF-Te = Stimulus fading of food texture, DR = Differential reinforcement, NCR = Noncontingent reinforcement, RTE = Repeated Taste Exposure, LAF = Limited access to food, BM = Behavioural Momentum

Table 2.
Interventions for food selectivity in children with ASD implemented by parents.

Study	Research Design	Methods	Duration	Participants	Food Consumption	Disruptive Behaviours	Follow-up
Anderson & McMillan, 2001	ABAB Examined parents ability to implement escape extinction.	DR, NRS, SF-A	37 sessions	5 year old boy with PDD	Consumption increased to 100%. Number of foods introduced not recorded.	Disruptive behaviours initially increased but decreased across intervention	No follow-up
Najdowski, Wallace, Doney & Ghezzi, et al., 2003	Multiple baseline. Compared the effect of using DR or DR + NRS	DR, NRS, Re, SF-A, SF-T	79 meals	5 year old boy with Autism	Consumption increased to the criterion number of bites in the DRA + NRS condition. Introduced 6 foods.	Not recorded	2 - 12 week follow-up: consumed novel foods and increased self-feeding.
Tarbox et al., 2010	ABAB Investigated effectiveness of NRM.	NRM	27 meals	3 year old boy with Autism	Meal consumption increased from 29% to 100%. Number of foods introduced not recorded.	Not recorded.	1, 2, 4 and 9 week follow-up: Meal consumption maintained at 100%.

PDD = Pervasive Developmental Disorder, NRS = Nonremoval of the spoon, Re = Representation, NRM = Nonremoval of the meal, DR = Differential reinforcement, SF-T = Stimulus fading of type of food, SF-A = Stimulus fading of amount of food,

frequently used procedure was differential reinforcement, which was used in 61.1% of studies. This was followed by nonremoval of the spoon (50%), representation (44%) and stimulus fading of the amount of food (44%). The remaining strategies were used in less than 27.8% of studies. Over half of the studies (55.6%) involved a combination of reinforcement and escape extinction strategies. Only three studies (16.7%) used reinforcement without escape extinction (Levin & Car, 2001; Wilder et al., 2005) and three used escape extinction without reinforcement (Freeman & Piazza, 1998; Paul et al., 2007). The large number of studies involving both escape extinction and reinforcement lends support to the importance of these types of strategies in addressing the food selectivity of children with ASD. This review also supports the notion that a variety of antecedent strategies are often included in multicomponent treatment packages even though their effects have yet to be extensively researched in isolation (Sharp & Jaquess, 2009).

Many of the interventions introduced multiple food items at the same time. Only five studies introduced food items to participants one at a time (Ahearn, 2003; Binnendyk & Lucyshyn, 2009; Kozlowski et al., 2011; Levin & Carr, 2001, Wilder et al., 2005). Ahearn (2002) compared the effects of introducing multiple or single food items and found that when children were introduced to foods one at a time they learned to accept them more quickly than if they were introduced to several foods at once. However, children who were introduced to several foods at once were more likely to generalize the effects of the intervention to non-targeted food items than children who were introduced to single foods.

Eleven of the studies were conducted in a clinic. Two studies (Ahearn, 2002; Levin & Carr, 2001) were implemented in schools and five (Anderson & McMillan, 2001; Binnendyk & Lucyshyn, 2009; Najdowski et al., 2003; Tarbox et al., 2010; Wood et al., 2009) were implemented in the home. While trained therapists implemented the interventions in all of the studies in Table 1, seven of these therapist-implemented interventions included a parent training component (Ahearn, Kerwin et al., 2001; Binnendyk & Lucyshyn, 2009; Kern & Marder, 1996; McCartney et al., 2005; Patel et al., 2007; Paul et al., 2007; Sharp & Jaquess, 2009). With the exception of two studies (Binnendyk & Lucyshyn, 2009; McCartney et al., 2005), the nature of parent training was not adequately described

and only four studies (Binnendyk & Lucyshyn, 2009; Kern & Marder, 1996; McCartney et al., 2005; Paul et al., 2007) presented data from parent-implemented sessions.

Parent-Implemented Interventions

As shown in Table 2, all three of the parent-implemented interventions involved some form of escape extinction. Nonremoval of the spoon was the most popular escape extinction technique, and was combined with differential reinforcement and stimulus fading of the amount of food in two of the studies. All of the studies but one (Tarbox et al., 2010) included multiple antecedent, reinforcement and escape extinction strategies as part of their treatment package.

Both Anderson & McMillan (2001) and Tarbox et al. (2010) gave a description of how parent training was carried out. This included delivering verbal instructions and providing feedback on treatment implementation as part of the training package. In addition to this, Anderson & McMillan (2001) used modelling procedures, written instruction, videotape review and role-play. Najdowski et al. (2003) did not describe specific parent training techniques, but did report that a consultant attended two or three parent-implemented meals a week.

Unlike the studies in Table 1 which used trained therapists to increase the food acceptance of children before parent training commenced, all three studies in Table 2 involved parents implementing the treatments from the outset. Each of these studies was conducted in the home setting. Najdowski et al. (2003) had the parents begin the intervention in their home and then later introduce it to a restaurant setting. This provides some evidence that parents can successfully increase their child's food consumption without improvements having first been gained by a therapist and that they can also effectively generalise intervention strategies across settings.

Aims of the Present Study

It has been suggested that parents may have difficulty implementing some strategies effectively (Hoch et al., 1994; Werle, Murphy & Budd, 1993). This reasoning has been used as justification for therapists implementing interventions and training parents after improvements have been gained. However, several studies have demonstrated that parents can successfully use even difficult strategies like escape extinction to increase the range of foods in their children's diets at home (Anderson & McMillan, 2001; Najdowski et al., 2003; Tarbox et al., 2010). In order to be of

use, the effects of any intervention must generalise to the home setting (Werle et al., 1993). Training parents to use intervention strategies at home may facilitate the maintenance of treatment effects in the absence of professional support. Given this, the current study had three aims:

a) The first aim was to demonstrate the effectiveness of multi-component behavioural treatment packages in ameliorating the food selectivity of children with ASD using procedures similar to those used by Binnendyk & Lucyshyn (2009).

b) The second aim was to teach parents to implement these interventions in their homes to increase the range of foods in their children's diets.

c) The final aim was to investigate whether these interventions would increase the children's preference for previously nonpreferred foods so that they consume the foods even in the absence of treatment strategies.

CHAPTER 2

GENERAL METHOD

Experimental Design

The present study used an AB repeated measures design replicated across five families in order to evaluate the effects of parent-implemented interventions for reducing food selectivity in children with ASD.

Participants

The five participants in this study were children who lived with their families in Christchurch, New Zealand. They had each been diagnosed with ASD and were reported by their parents to have restricted diets. They were recruited through their prior association with the investigator, after receiving information about the study from their paediatrician or after viewing an advertisement on the Autism New Zealand website. Informed consent was obtained from each of the parents of the five children after they had been provided with an information sheet. This information sheet has been reproduced in Appendix I. Ethical approval was gained from the University of Canterbury Human Ethics Committee. A copy of this letter may be found in Appendix II. A detailed description of each of the participants will be outlined as a case study in subsequent chapters.

Measures

Dietary repertoire: A description of each child's current dietary repertoire was recorded pre intervention and at follow-up. Parents were asked to list all the foods their child would currently eat in each of the five food groups: fruits, vegetables, grains, dairy and protein. This information was used to identify which food groups were restricted, to inform the decision of which foods to target during the intervention, and to provide some measure of whether the effects of the intervention were generalized beyond those foods that were specifically targeted.

Preference Assessments: Preference assessments were conducted during baseline, intervention and at follow-up. Five target non-preferred foods and one control preferred food were selected for each child. These foods were nominated by parents during the initial interview after discussing which food groups were restricted, which foods the child preferred, which had previously

eaten but were now refused, and which foods would offer a range of tastes and textures. Preference assessments were conducted in order to assess the child's preference for these foods.

The assessments were conducted by the investigator at the dining room table of the child's home. During each trial of the preference assessment, the child was presented with a bite-sized piece of a target food and given the verbal instruction "Take a bite". If the food was not eaten, it was withdrawn after 15 seconds. If the child chose to eat the food, he or she was allowed to finish it before moving on to the next trial. No praise or reward was given for accepting or rejecting the food and disruptive behaviours were ignored. Each of the five target foods were presented three times during each assessment. The control food was presented five times. The foods were presented in a random order with the exception of the control food which was spread throughout the session in order to maintain the child's motivation to remain at the table.

During each preference assessment, the investigator recorded the child's food acceptance and disruptive behaviours on a Preference Assessment Data Sheet. A copy of this sheet is presented in Appendix III. Food acceptance was recorded if the child picked up the food and ate it within 15 seconds of its presentation. Disruptive behaviours included verbal protests, acts of aggression (hitting, kicking etc.), expelling or gagging on the food, leaving the table, and throwing or pushing the food away. The percentage of trials in which the child engaged in food acceptance was calculated for each preference assessment. This was done by dividing the number of trials that the child accepted each food by the total number of trials in which that food was offered and multiplying the total by 100. The percentage of trials in which the child engaged in disruptive behaviours was also calculated. For each food, the number of trials in which the child engaged in disruptive behaviours was divided by the total number of trials in which that food was offered. The sum of this was then multiplied by 100.

Parent Intervention Data: Data was collected during parent intervention sessions in order to track the child's progress and to inform the intervention process. During each intervention session, parents recorded food acceptance and disruptive behaviours on an Intervention Data Sheet. This data sheet is reproduced in Appendix IV. The sheet also provides space to record the target food, target behaviour and the reward given for consumption. Food acceptance was defined as the child opening

his or her mouth to willingly accept and swallow food delivered either independently or by a parent. Disruptive behaviours included verbal protests, acts of aggression, expelling or gagging on the food, leaving the table, and throwing or pushing the food away. The percentage of trials in which the child engaged in food acceptance and disruptive behaviours was calculated for each parent session in the same manner as percentage of acceptance and disruptive behaviours were calculated during preference assessments. This data was collected during intervention and at follow up.

***Family Quality of Life*:** The Beach Center Family Quality of Life Scale (FQOL: Hoffman, Marquis, Poston and Turnball, 2006) was used to assess parents' perception of their family's quality of life. This 25 item questionnaire used a five point Likert scale (1 – 'Very dissatisfied' to 5 – 'Very satisfied') to measure parents' satisfaction on five subscales: Family interaction, Parenting, Emotional Well-being, Physical/Material Well-being and Disability-Related Support. This questionnaire has been shown to have good reliability and validity (Hoffman et al., 2006). Average ratings were used to calculate satisfaction on each of the subscales and as a measure of overall family quality of life. Both parents of each of the children completed this scale during baseline and post-intervention.

Social Validity: The social validity of the intervention was measured using the Goodness of Fit Survey (Albin, Lucyshyn, Horner & Flannery, 1996). This survey measures how well parents believe that an intervention fits within the context of their family and how effective they think it will be. The survey contains 20 items (e.g. 'Does the plan address your highest priority goals for your child and family?') and asks that parents record their responses on a 5-point Likert scale (1 – 'Not at all' to 5 – 'Very well/much'). Average ratings were used as the measure of overall goodness of fit. Both parents of each of the children completed the Goodness of Fit Survey during baseline and post-intervention.

Inter-observer Reliability: Inter-observer reliability was calculated for parent intervention data and preference assessment data. The investigator observed and collected data during 33% of parent intervention sessions. Agreement was considered when the parent and the investigator recorded the same target behaviour and the same disruptive behaviours during the same trial. In addition, 28% of the preference assessments were video-taped. A second observer viewed and scored these videos. Inter-observer reliability was calculated by dividing the number of agreements by the

sum of agreements and disagreements and multiplying the total by 100. Agreement was 97.14% for parent intervention sessions and 96.54% for preference assessments.

Intervention Materials

Parent Intervention Information Sheets: The parents were given a detailed outline of the intervention plan for their child as well as a laminated 'cheat sheet' which gave a brief description of each step of that intervention.

Token Economy Systems: Token boards were made from laminated A4 paper with a row of Velcro dots attached to the front. Tokens were made out of images of topics/themes suggested by the parents as interesting to their child (e.g. dogs, trains or natural disasters). These images were located through a Google Images search. Each token was approximately 4cm², laminated and had Velcro stuck to the back so that it could be attached to the token board. The token boards contained space for either five or ten tokens.

Visual Aids: Visual aids were in the form of 'First/Then' boards. Each board was made out of laminated A5 paper with a Velcro dot at the top and at the bottom. Above the Velcro at the top was the word 'First' written in permanent marker. Above the Velcro at the bottom was the word 'Then'. A large arrow was drawn between the dots pointing from 'First' to 'Then'. Images showing target eating behaviours were created using the Windows Vista Paint programme and laminated. These images included; 'Touch' showing a hand touching food, 'Kiss' showing a boy kissing food, 'Lick' showing a boy licking food and 'bite' showing a boy with food in his mouth. These images are reproduced in Appendix V. Images of reinforcing foods and activities were located using a Google Images search and laminated. Velcro was attached to the back of each image so that they could be attached to the 'First/Then' boards.

Procedures

Functional Assessment: A functional assessment was conducted in order to form a hypothesis about the function of each child's food refusal. This assessment involved an initial interview with the child's parents and two observations of the child's evening meal at home. The interview form was modified from O'Neil et al.'s (1997) Functional Assessment Interview Form. This form provided space for describing the development of food selectivity, the child's past and

current diet, disruptive behaviours, ecological and antecedent events, current meal routines, history of intervention, family ecology and goals. It also contained questions relating to toys, foods, activities and themes that the child liked and found reinforcing.

The Functional Assessment Observation Form was used to record information about the child's dinner-time behaviours during the dinner observations. This form provides space to record selected behaviours, their predictors, their perceived functions and their actual consequences. During the observations, the parents were asked to conduct a normal meal with at least one non-preferred food on their child's plate and to behave as they normally would when asking him or her to eat the food.

Baseline: During baseline, four preference assessment sessions were conducted in order to measure the child's pre-intervention preference for the target foods and to create a preference hierarchy. A food preference hierarchy was established for each child by tallying the total number of times each target food was accepted and subtracting the total number of times it was rejected. The foods were then ranked in order of most preferred to least preferred. If the child rejected all the target foods in each of the baseline sessions, the total number of disruptive behaviours he or she engaged in was calculated for each food. Food preference was then ranked according to how disruptive the child was when presented with the food (e.g. the food with the least disruptions was placed at the top of the preference hierarchy). Both parents of each child were asked to complete the Beach Center Quality of Life Scale once during baseline.

Intervention Development: Information gathered from the interview, observations and baseline preference assessments was used to develop an initial intervention plan. A copy of the intervention plan was given to the parents and discussed in detail. Any concerns or suggestions were addressed and revisions were made to the intervention plan as necessary. The parents decided who would introduce the intervention and whether they would later teach the other parent to implement the strategies. Finally, the parents were asked to complete a Goodness of Fit Survey to measure their perceptions of the suitability of the intervention plan.

Parent Intervention: Each intervention was designed and tailored individually to best meet the needs of each of the families. These will be described in the chapters that follow. All the interventions

shared some common strategies. These strategies are described in Table 3. Parents were asked to implement the intervention three or four times a week. The investigator conducted in vivo training during the first three intervention sessions and during subsequent observation sessions. Training consisted of verbal instructions, modelling new strategies to parents and providing feedback at the end of a session. Preference assessments were conducted once every second week (after approximately 6 intervention sessions).

Table 3.
General Parent Intervention Strategies.

Strategy	Design
Foods targeted by preference	Foods at the top of preference hierarchies were targeted first. When the child could eat appropriate portions of this food the next food on the preference list was introduced.
Preferred activity choice	At the beginning of each session, the child was shown images of preferred activities and prompted to choose which activity he or she would like to work for. This image was then attached to the token board.
Repeated taste exposure	Parents presented the same food several times each session.
Stimulus fading of amount of food	Initially parents presented small portions of the target food. When the child consumed that portion during 80% of trials and engaged in disruptive behaviours during less than 20% of trials for two consecutive sessions the portion size was increased. This continued until the child could eat appropriate portions of the food as set out by their parents.
Visual schedule	The child was shown a First/Then board showing what he or she must do with the food and what reinforcement would be delivered (a preferred food and/or a token).
Social reinforcement	Each time the child consumed the food the parents gave him or her praise, hugs, tickles, or high-fives.
Token Economy System	The child was given a token each time he or she engaged in the target behaviour. The parents prompted him or her to count how many more tokens would be needed to access the preferred activity. When the child had earned all the tokens he or she was allowed access to this activity
Prompting	If the child refused to eat the food, the parents used a prompting procedure. Initially the parents used a verbal prompt, followed by a verbal and pointing prompt, and finally a partial physical prompt (placing the spoon in the child's hand and lifting the hand toward his or her mouth). The parents were instructed not to restrain their child and to never force the food into the child's mouth.
Escape Extinction	The child was not allowed to leave the table during intervention sessions. If he or she tried to leave, the parents issued a verbal prompt and used gentle physical guidance when necessary. If the child expelled the food, the parents simply presented a new spoon of the same food and reissued the verbal prompt.
De-escalation procedure	If the child became upset, the parents ignored any disruptive behaviour, moved out of reach and waited for the child to calm down before reissuing the instructions. The child was given verbal praise for being calm. If he or she was unable to calm down within a pre-specified length of time, the parents terminated the session. The child was not allowed to access the preferred activity or given any other food for 30 minutes following the session.

Follow-Up: Follow-up measurements were conducted 4 to 12 months after the end of the intervention. It was not possible to standardize the follow-up intervals because of the delays caused by multiple earthquakes during the study (see discussion). Follow-up involved another semi-structured interview with the parents, a final parent session, and a preference assessment. During the parent session, parents were asked to present their child with each of the five target foods once. They were instructed to use whichever methods they currently used to get their child to eat non-preferred foods. The follow-up preference assessment was conducted in the same manner as the baseline and intervention preference assessments.

CHAPTER 3

THOMAS AND HIS FAMILY

The first of the five cases involved a five year old boy, who was the middle of three children, in a family where both parents chose to take part in the intervention training. This intervention began in August 2010.

Method

Participants

Thomas was a New Zealand boy of European descent who was diagnosed with Autism. He lived at home with his parents and two sisters and was in his first year at the local, mainstream primary school. He used verbal language as his primary form of communication, although it was delayed. From the age of two years he had become increasingly food selective. Initially his parents thought that this was a normal developmental phase but he continued to refuse to eat novel foods and to engage in disruptive behaviours as he got older. Thomas was gluten-intolerant and his parents reported that some of the foods he ate made him feel sick. They initially found it extremely difficult to introduce his gluten-free diet. Prior to the study, Thomas typically received different meals from the rest of his family because of his gluten intolerance and food selectivity.

When presented with non-preferred foods Thomas engaged in a variety of disruptive behaviours. These included crying, yelling, hitting and running away from the table. If his parents tried to put a nonpreferred food in his mouth he tended to spit it out or gag. Thomas ate a range of foods from most food groups but refused to eat any vegetables. His parents tried to ensure that he had a balanced diet by blending vegetables up and hiding them in foods that he liked. However, if a preferred food was presented in a different way or was of a different brand Thomas often refused to eat it. On average, he refused to eat foods he usually liked about once a day. His parents reported that they only occasionally served him non-preferred foods, as they knew he would refuse them.

Thomas had previously been referred to a dietician due to his parents' concern about his restricted diet. However, the dietician concluded that he was not at risk for malnutrition and so provided no further support. Thomas's ABA therapist had successfully introduced a gluten-free

cereal into his diet during his private therapy. She initially rewarded him with a small piece of chocolate for trying a piece of the cereal. As his acceptance increased, she gradually increased the amount of cereal he had to eat in order to receive the chocolate. Eventually Thomas was able to eat the cereal without being rewarded and even requested it from time to time.

Assessment

Functional assessment: A functional assessment was conducted in the manner described in Chapter 2. Based on this information, it was concluded that Thomas's food selectivity was maintained by negative reinforcement of his escape behaviours. This information was used to guide the design of Thomas's intervention.

Preference assessment: Preference assessments were conducted in the manner described in Chapter 2. However, in order to help him stay calm, Thomas was allowed a five minute break after the 10th trial of each session. As he refused to try any of the nonpreferred foods during baseline preference assessments, a preference hierarchy was constructed based on the number of times he engaged in disruptive behaviours for each food. His target nonpreferred foods (in order of preference) were rice, pasta, carrots, scrambled eggs and peas. His parents selected rice crackers as his control preferred food. Preference assessments were conducted throughout the intervention and a follow up session was conducted one year post-intervention.

Parent Intervention

Thomas's parents initially opted to run the intervention as 'food-training' sessions in the afternoons. They made this decision because they already had a consistent tea-time routine in place which they did not wish to disrupt. Both parents chose to take part in the delivery of the intervention. During food training sessions they implemented the strategies outlined in Chapter 2. Each session, one parent offered Thomas one teaspoon of the first target food (rice) 10 times in a row. Each time he consumed the food he was given praise, a reinforcing food (e.g. a small piece of chocolate, a jellybean or a piece of biscuit) and a train token. When Thomas had earned all 10 tokens he was allowed to access his preferred activity (a DVD or the computer).

When Thomas consumed the target amount of food during 80% of trials and engaged in disruptive behaviours during fewer than 20% of trials for two consecutive sessions, the amount of

food he was required to eat to access reinforcement was increased to two teaspoons. From then on, amounts were increased by an extra teaspoon (e.g. from two teaspoons to three teaspoons) whenever he met the acceptance criteria. If Thomas became upset during a session and was unable to calm down after 15 minutes, the session was terminated. He was not allowed access to his reinforcing activity for the remainder of the day and could not have any other food for at least 30 minutes.

After Session 10, a decision was made to reduce the number of trials conducted each session from ten to five. This was because Thomas's parents became concerned that having so many trials made it difficult for him to consume larger amounts of food. Pasta was targeted after Session 20 of the rice intervention. At his parents' request, all sessions after Session 21 were conducted as part of the family tea-time. This was done because it was felt that Thomas would cope better with the intervention if it was conducted within a natural meal context. Due to time constraints, only rice and pasta were targeted for intervention during the present study. One follow-up parent session was conducted a year after the end of the intervention in the manner described in Chapter 2. An additional observation of the family tea-time was also conducted during this time at the parents' request, as they felt that Thomas would respond better in a more natural context.

Results

Preference Assessment

The percentage of trials in which each food was accepted were calculated during baseline, intervention and follow-up preference assessments. Figure 1 shows Thomas's percentage of acceptance for three of the nonpreferred foods (rice, pasta and carrot) and the control food (rice cracker). During baseline, Thomas did not accept any nonpreferred foods. His acceptance of the control food (rice cracker) varied between 60% and 100%. During the intervention phase, Thomas's acceptance of rice crackers remained high (M = 94.2%). His average acceptance of rice (M = 4.7%) and pasta (M = 9.4%) increased a little but remained low. Interestingly, Thomas only accepted pasta in preference assessments while rice was being targeted in parent intervention sessions. Once pasta was specifically targeted in parent intervention sessions (after Preference Assessment 8), his acceptance during preference assessments dropped to zero. Thomas continued to refuse carrots, peas and scrambled eggs throughout the intervention phase. During the follow-up preference assessment,

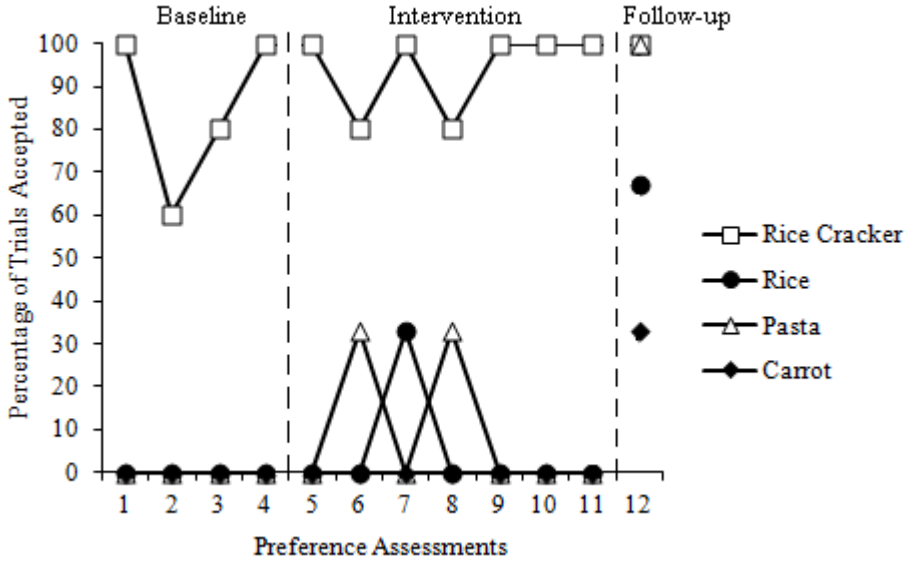

Figure 1. Percentage of trials in which Thomas engaged in acceptance for three nonpreferred and one control food during (a) baseline, (b) intervention and (c) follow-up preference assessments**.**

Thomas's consumption of pasta was 100%, while his acceptance of rice and carrots was 67% and 33% respectively. This appears to indicate that at the one year follow-up, Thomas's preference for these foods had increased. However, his preference for peas and scrambled eggs remained at zero.

The average percentage of trials in which Thomas engaged in disruptive behaviours was also calculated for each food during baseline, intervention and follow-up preference assessments. These are shown in Figure 2.

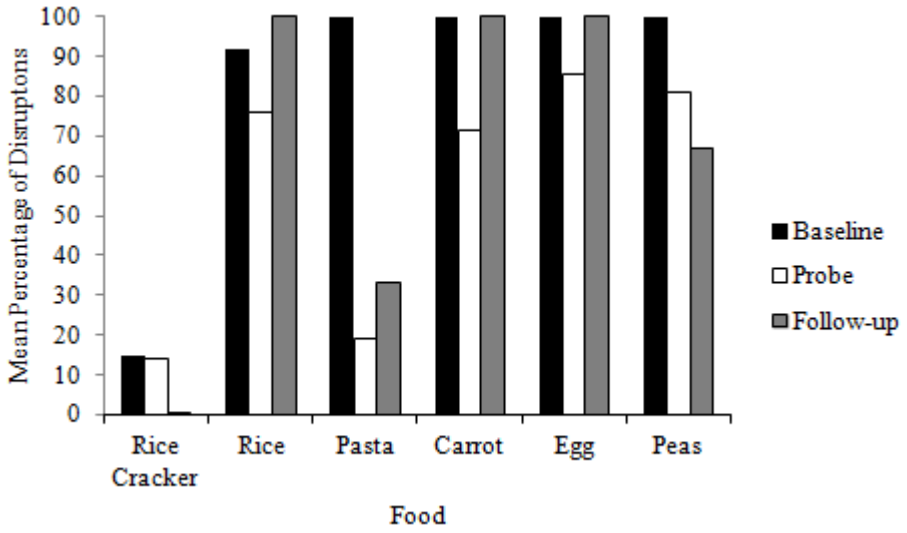

Figure 2. Mean percentage of trials in which Thomas engaged in disruptive behaviours for each food during (a) baseline, (b) intervention and (c) follow-up preference assessments.

The mean percentage of trials in which Thomas engaged in disruptive behaviours decreased from baseline to intervention for all nonpreferred foods. During the follow-up preference assessment, Thomas's percentage of disruptive behaviours decreased further still for rice crackers and peas. However, they increased to baseline levels or higher for rice, carrot and scrambled eggs. Disruptive behaviours also increased for pasta during the follow-up preference assessment, but remained lower than baseline levels.

Parent Intervention Data

The percentage of trials in which Thomas engaged in food acceptance and disruptive behaviours when presented with rice or pasta were calculated for each parent intervention session. These are presented in Figure 3. Thomas accepted one teaspoon of rice during 100% of trials following the introduction the intervention. His disruptive behaviours steadily decreased to zero while the criterion amount remained at one teaspoon. When the criterion amount was raised to two teaspoons per trial, his consumption remained at 100% for Sessions 5, 6 and 7, but his disruptive behaviours increased. During Sessions 8 and 9, Thomas's acceptance of rice dropped to zero and his disruptive behaviours increased to 100%. At this point it was decided to reduce the number of trials per session to five instead of ten, and to target one teaspoon of rice instead of two. This produced a rapid increase in Thomas's food acceptance and a decrease in his disruptive behaviours. These changes were maintained when the criterion amount of rice was once again raised to two teaspoons. However, when the criterion amount was raised to three teaspoons, Thomas's acceptance and disruptive behaviours began to fluctuate. After six sessions (Sessions 16-21), Thomas's parents agreed to introduce the intervention as part of their regular teatime meal, as they thought that he would cope better in a more natural meal setting. They continued to target three teaspoons of rice and to reinforce Thomas with a preferred food at their family evening meal. Thomas's acceptance immediately increased to 100% and his disruptive behaviours decreased to zero for the remaining two sessions of the intervention.

When pasta was introduced, Thomas's consumption initially increased to 20%, then decreased to zero in Session 2. His disruptive behaviours remained at 100% throughout both sessions. Session 3 was conducted as part of the family teatime and Thomas accepted 100% of the pasta for the

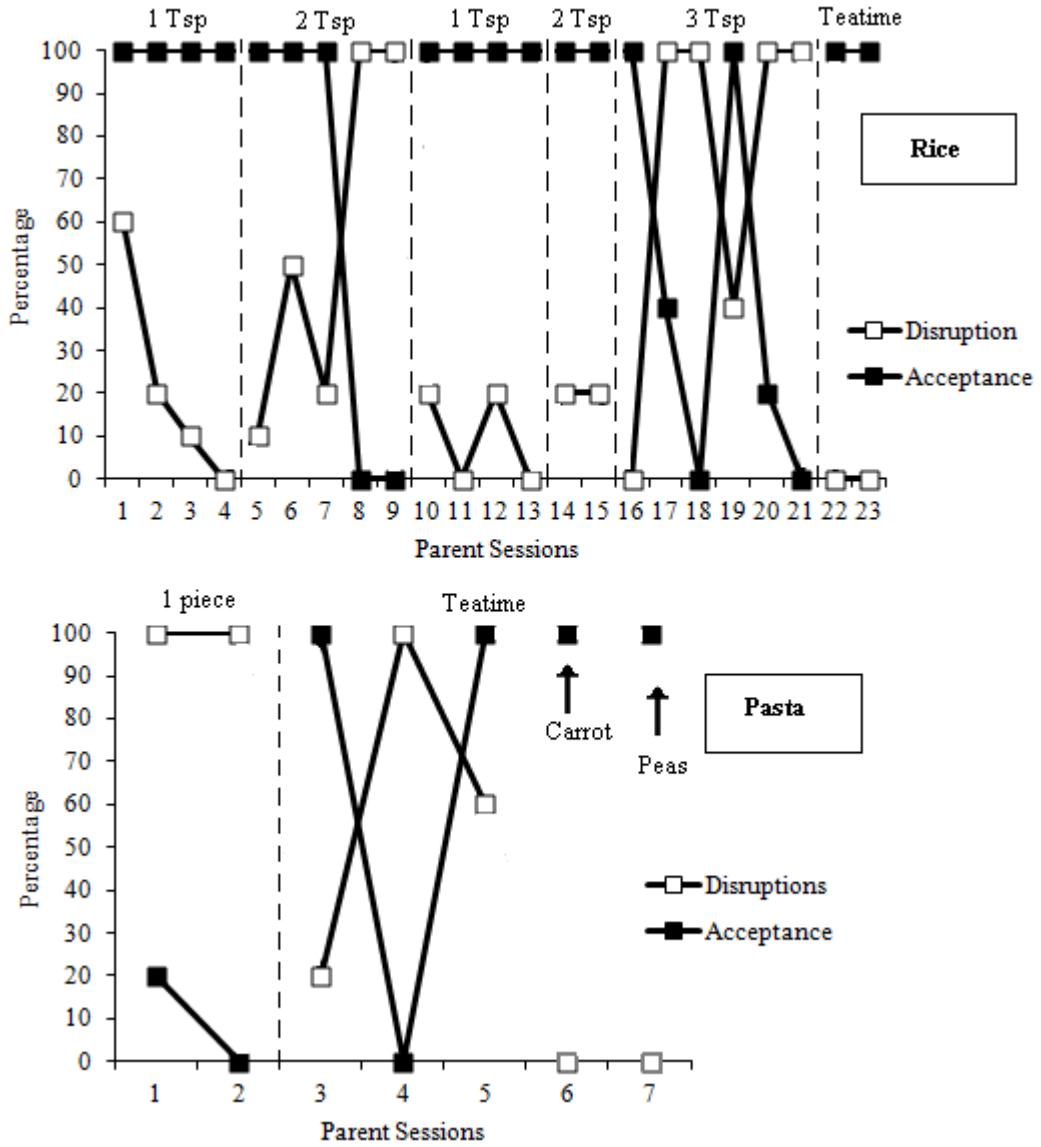

Figure 3. Percentage of trials in which Thomas engaged in (a) food acceptance and (b) disruptive behaviours during parent intervention sessions.

first meal. During Session 4, his acceptance dropped back to zero and his disruptive behaviours increased to 100%. However, his parents reported that he had been at a birthday party that afternoon and felt that he was simply not hungry. During Session 5, acceptance responses returned to 100% and his disruptive behaviours decreased to 60%. In Sessions 6 and 7, his parents conducted probes of one teaspoon of carrot and one teaspoon of peas. Thomas consumed the required teaspoon without engaging in any disruptive behaviours during both sessions.

During the follow-up session, Thomas consumed 100% of the offered pasta. However, he refused to eat rice, carrot, peas or scrambled egg. His parents reported that it was not a typical session

and that during meals he regularly consumed these foods. A follow-up observation of the family evening meal was conducted. During this observation, Thomas consumed 100% of the peas and two other nonpreferred foods that had not been targeted during intervention (potato and cucumber). Unfortunately, data could not be collected on carrots, rice or scrambled eggs as the family did not have these foods available at the time of the observation. During the interview, Thomas's parents reported that the most useful strategies they learned were to present small portions and to deliver a reinforcing food (e.g. dessert) contingent on Thomas's acceptance of nonpreferred foods.

Dietary Repertoire

The foods that Thomas's parents reported him to eat from each food group during pre-intervention and follow-up interviews are displayed in Table 4. Thomas's parents reported that he consumed 22 foods before the intervention and 35 foods at follow-up. During the follow-up interview, they reported that he ate four new vegetables, five new foods from the grains group and four new foods from the proteins group. Four of these new foods (rice, pasta, peas and carrots) were outlined at the beginning to the study as foods that Thomas's parents would like to introduce. They reported that he continued to refuse to eat scrambled egg.

Table 4.
Thomas's Reported Dietary Repertoire at Pre-intervention and Follow-Up.

Food Group	Pre-Intervention	Follow-up
Vegetables	None	Peas
		Carrots
		Cucumber
		Potato
Fruit	Apple	Apple
	Banana	Banana
	Mandarin	Mandarin
	Orange	Orange
	Pineapple	Pineapple
	Dried apricots	Dried apricots
	Raisins	Raisins
Grains	GF Pizza	GF Pizza
	GF Mince Pies	GF Mince Pies
	GF Cereal	GF Cereal
	GF Toast	GF Toast
	Rice wafers	Rice wafers
	Rice crackers	Rice crackers
	Rice cookies	Rice cookies
		Rice
		GF pasta
		GF Waffles
		GF Pancakes
		Nachos
Dairy	Cheese	Cheese
	Yoghurt	Yoghurt
	Milk	Milk
Proteins	Sausages	Sausages
	Peanut butter	Peanut butter
	Salami	Salami
	Mince	Mince
	Ham	Ham
		Bacon
		Meat chops
		Steak
		Salami

GF = Gluten Free

Family Quality of Life

The mean total and subscale FQOL scores were calculated for both Thomas's parents at baseline and post-intervention. This information is displayed in Table 5. Thomas's mother's total FQOL score increased from baseline to post-intervention. Her average scores increased for four subscales and remained the same for one subscale (Parenting). The most significant changes in pre

Table 5.
Thomas's Parents' Total and Subscale FQOL Scores at Baseline and Post-Intervention.

	Mother		Father	
Scale	**Baseline**	**Post-intervention**	**Baseline**	**Post-intervention**
Family Interactions:	3.83	4.17	4.17	3.50
Parenting:	3.83	3.83	4.50	3.50
Emotional Well-being:	2.50	3.50	4.00	2.75
Physical/Material Well-being:	4.40	4.80	4.80	3.80
Disability-Related Support:	4.00	4.50	4.75	4.00
Total:	3.76	4.16	4.44	3.60

and post- intervention scores occurred in the Emotional Well-being and Disability-Related Support subscales. Conversely, Thomas's father's total FQOL score decreased from baseline to post-intervention. His average scores significantly decreased for all subscales.

Social Validity

The mean score for the Goodness-of-Fit Survey was calculated for both Thomas's parents at baseline and post-intervention. His mother's mean scores indicated that both before (M = 4.5) and after the intervention (M = 4.6) she felt the intervention plan fitted well within the context of her family. Post-intervention, she indicated that she believed that the intervention plan was effective. Thomas's father's mean score during baseline and post-intervention were the same (M = 4.3) indicating that he too felt the intervention plan was a good fit both before and after the intervention. He rated the intervention plan as very effective.

Discussion

The results showed that during the intervention Thomas's parents were able to introduce rice and pasta to his diet. Preference assessments indicated that Thomas's preference for these foods increased little over the intervention period. At the follow-up parent session, Thomas only ate pasta but was observed eating peas at an evening meal. His parents claimed that he usually ate rice and carrots as well. They also reported that they had introduced another nine foods to his diet. The follow-up preference assessment indicated that Thomas's preference for rice, pasta and carrots had improved relative to baseline and intervention. His parents felt the intervention had been effective and said that the most useful strategies they had learned were stimulus fading of the amount of food and differential reinforcement. After the intervention, Thomas's mother's perception of family quality of life had increased slightly, while his father's showed a significant decrease.

CHAPTER 4

JORDAN AND HIS FAMILY

The second case in this study involved a 4-year old boy who was the middle of three children. Both of his parents took part in the study, although only his mother participated in intervention training. The intervention began in September 2010.

Method

Participants

Jordan was a New Zealand boy of European descent who had been diagnosed with ASD. He attended a mainstream preschool and lived at home with both his parents and his two sisters. He communicated primarily using simple words or by physically guiding people to what he wanted. His language was delayed and had only emerged over the previous year. His parents reported that he was a good eater as a baby but that when he was around two years old his diet seemed to suddenly become restricted. Since that time he had continued to be food selective.

Jordan's parents had chosen to put him on a gluten and lactose free diet and had also limited his sugar intake. He ate a range of meats, baked beans, gluten-free bread, cornflakes, popcorn, soy milk and soy cheese. The only fruit or vegetables he ate were raisins and potato wedges. He also ate bananas but was not allowed them very often because of their sugar content. His parents tried to give him a non-preferred food at every evening meal but reported that he refused to touch it, pushed the plate away, screamed, hit and ran away until the food was removed.

Jordan's mother had tried several strategies to get him to try nonpreferred foods. She had tried waiting until his sisters had left the table and then instructing him to eat a nonpreferred food while holding it up to his mouth or trying to place it in his mouth. She had tried issuing repeated verbal instructions and preventing Jordan from leaving the table. Sometimes this strategy worked and Jordan ate the food after about an hour. However, she reported that this was not very effective in increasing the number of foods he liked and that these strategies were often very distressing for Jordan and the rest of the family. Jordan's parents reported that they would like to learn strategies to help Jordan stay calm while eating nonpreferred foods.

Assessment

Functional assessment: As discussed in Chapter 2, a functional assessment was undertaken in an attempt to identify variables maintaining Jordan's food refusal behaviours. This assessment suggested that his food selectivity was maintained by the negative reinforcement of his escape behaviours. This information was used to guide the design of his intervention.

Preference Assessment: Baseline preference assessments were conducted in the manner described in Chapter 2 except that Jordan was allowed a five minute break after ten trials in each session in order to help him stay calm. In addition, he was given a raisin each time he returned to the table independently and was frequently praised for 'good sitting' throughout the session to teach him to remain at the table. Jordan refused to eat any of the five nonpreferred foods during baseline, so a preference hierarchy was constructed based on his disruptive behaviours. That is, the food with the greatest number of disruptive behaviours was ranked as the least preferred food. Jordan's target foods (in order of preference) were orange, peas, apple, rice and mashed potato. His parents selected raisins as his control preferred food. Preference assessments continued throughout the intervention phase and a follow-up session was conducted four months after the end of the intervention.

Parent Intervention

Jordan's mother implemented the intervention and chose not train to his father how to do it as she reported that he found getting Jordan to eat new foods very distressing. She decided to implement the intervention at lunch time as she felt he would be calmer with fewer people around. During lunch, Jordan's mother presented him with a 1 cm^2 piece of the first target non-preferred food (orange) five times. In addition to the strategies outlined in Chapter 2, she used a behaviour shaping procedure to teach him how to eat the nonpreferred foods. This procedure involved targeting and reinforcing behaviours that were approximations of eating the food. Jordan's criterion behaviours (in order) were to leave the food on his plate, to kiss the food, lick the food, bite the food (place it between his teeth), put the food in his mouth, and finally to eat the food. Each time Jordan engaged in the targeted criterion behaviour he was given a train token and a small piece of chocolate. Once he had earned all five tokens Jordan was allowed to access his preferred activity (Xbox, a train, computer, DVD, fries, lolly-pop or play outside).

When Jordan was able to engage in the criterion behaviour during 80% of trials and engaged in disruptive behaviours during less than 20% of trials for at least two consecutive sessions, the next behaviour in the shaping list was introduced. Once he had mastered eating the food (the final criterion behaviour), the amount of food he was required to eat before receiving reinforcement was gradually increased. The meal was terminated if Jordan stayed upset for 10 minutes, as his mother reported that she found it difficult to stay calm if he was distressed. She agreed not to allow him to have access to his preferred activity or have another food for 30 minutes if the session was terminated. Due to time constraints only oranges and peas were specifically targeted during intervention. A follow-up parent session was conducted four months after the intervention had finished.

Results

Preference Assessment

The percentage of trials in which Jordan engaged in food acceptance during preference sessions was calculated for each food. The results for orange, peas and raisins are displayed in Figure 4. Jordan's acceptance of the control food (raisins) was high throughout baseline (M = 90%) and intervention (M = 85%). He did not accept any nonpreferred foods during baseline. During the first preference session of the intervention phase, Jordan consumed orange on 33% of the trials. Unfortunately, orange had to be excluded from subsequent intervention preference sessions. This was because Jordan began vomiting when he consumed orange during parent intervention sessions. Jordan did not accept any of the other nonpreferred foods during preference sessions throughout the rest of the intervention. At follow-up, he accepted 100% of the raisin and refused all other foods.

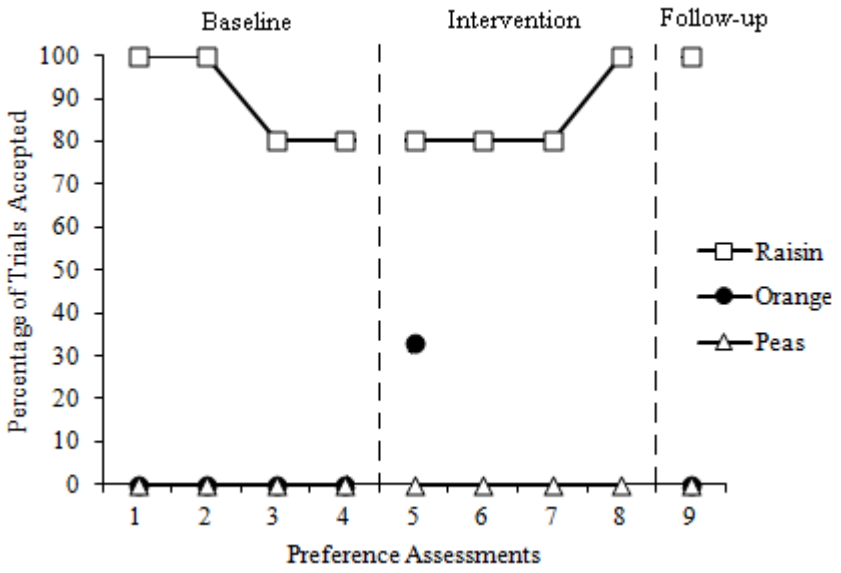

Figure 4. Percentage of trials in which Jordan engaged in acceptance for two nonpreferred and one control food during (a) baseline, (b) intervention and (c) follow-up preference assessments**.**

The percentage of trials in which disruptive behaviours occurred were also calculated for each food. Figure 5 shows the average percentage of disruptive behaviours Jordan engaged in for each food during baseline, intervention and follow-up.

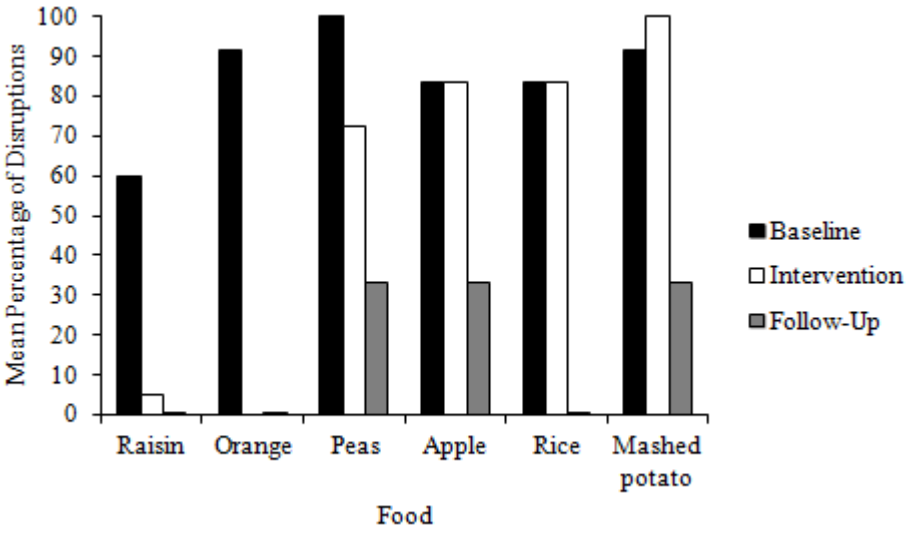

Figure 5. Mean percentage of trials in which Jordan engaged in disruptive behaviours for each food during (a) baseline, (b) intervention and (c) follow-up preference assessments.

During baseline, the mean percentage of disruptive behaviours was relatively high for all foods (>59%). During intervention, disruptive behaviours decreased for the control food (raisins) and for peas. They remained at baseline levels for apple and rice, and increased for mashed potato. Data is

not presented for orange during the intervention phase, as this was discontinued after the first probe preference session, in which he engaged in disruptive behaviours during 33% of trials. During the follow-up preference session, Jordan's disruptive behaviours decreased for all foods from baseline and intervention levels.

Parent Intervention Data

The percentage of trials in which Jordan engaged in food acceptance and disruptive behaviours when presented with orange and peas was calculated for each parent intervention session. These results are presented in Figure 6.

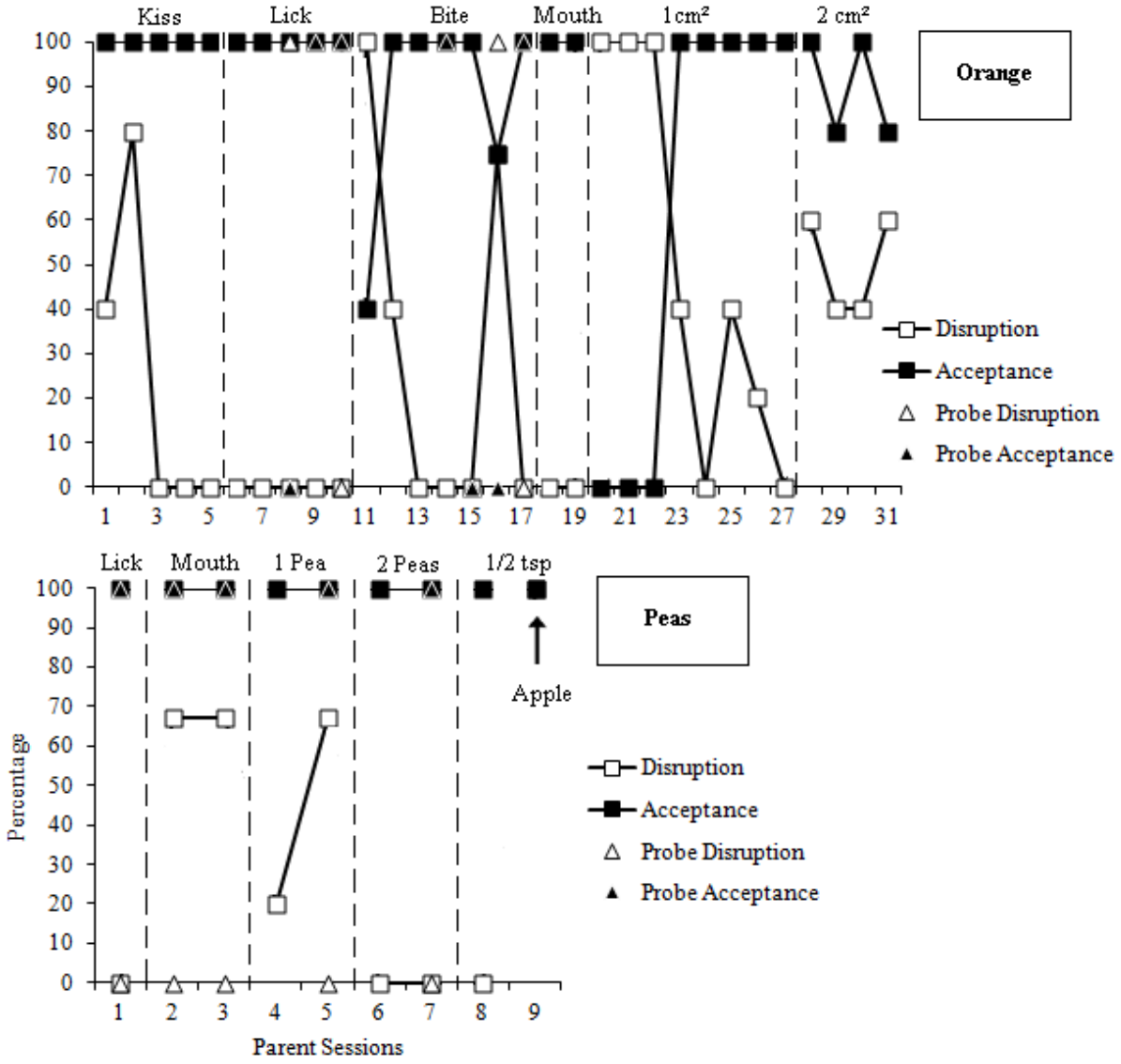

Figure 6. Percentage of trials in which Jordan engaged in (a) food acceptance and (b) disruptive behaviours during parent intervention sessions.

When parent intervention sessions began, Jordan immediately complied with instructions to kiss the orange. For the last three sessions of the phase disruptive behaviours decreased to zero. The criterion behaviour was raised to 'lick the orange' after Session 5. Jordan continued to comply with instructions during 100% of trials and did not engage in any disruptive behaviours. During Session 8, Jordan's mother decided to probe the next criterion behaviour ('bite' orange) during the last trial. That is, she instructed Jordan to lick the orange for four trials and then instructed him to bite the orange for the fifth trial. Jordan refused to comply during this final trial, so she continued to target lick during the first four trials and target bite for the last trial for the next two sessions. As Jordan complied with the bite probe for both of these sessions and did not engage in any disruptive behaviours, his mother introduced the bite phase (five trials of 'bite the orange') in Session 11. After Jordan had engaged in 100% acceptance for two sessions during the 'bite' phase, his mother began to probe the next criterion behaviour in the list (putting the orange in his mouth) during the last trial of each session. She introduced the 'in mouth' phase in Session 18 and then started instructing him to eat a 1cm² peice of orange in Session 20. Jordan refused to accept orange until his mother presented it on the end of a potato fry during Session 23. The fry was successfully faded out of the last two sessions of the phase (Sessions 26 and 27). The criterion amount of orange Jordan was required to eat in order to access reinforcement was raised to 2 cm² in Session 28. His acceptance of orange fluctuated over the next five sessions but remained above 80%. His disruptive behaviours also fluctuated between 40% and 60%. During the last three sessions Jordan gagged and vomited several times after eating orange. After much discussion with his mother it was decided to discontinue targeting orange and to move on to targeting peas.

During the first pea session, Jordan complied with the instruction to lick the pea during 100% of the first three trials. His mother changed the criterion behaviour to putting the pea in his mouth for the final two trials of the session. Jordan complied with these instructions and did not engage in any disruptive behaviours throughout the session. His mother introduced the 'mouth' phase (where he was required to place a pea in his mouth) during Session 2, and probed eating one pea during the last two trials of Session 3. Again, Jordan complied during all trials of both sessions, although his disruptive behaviours increased to 67%. During the next two phases of the intervention (where one

pea and then two peas were targeted), Jordan's mother probed the next criterion behaviour in the list for the last two trials of the second session of each phase. As Jordan accepted 100% of peas during each session, his mother introduced half a teaspoon of peas in Session 8. Again Jordan accepted peas for 100% of the trials and did not engage in any disruptive behaviours. During the final session, Jordan's mother was asked to conduct a probe of each of the target behaviours while introducing apple. During this probe, Jordan complied with instructions to kiss, lick and place the apple in his mouth for the first four trials without engaging in any disruptive behaviours. During the final trial he ate a 1 cm^2 piece of apple, although his disruptive behaviours increased. At the follow-up parent session, Jordan accepted peas but refused to eat any of the other target nonpreferred foods. However, he did comply with his mother's instructions to put the potato, orange, and apple in his mouth. During the follow-up interview, Jordan's mother reported that the most useful thing she had learned during the intervention was to simply persist in presenting him with nonpreferred foods. She reported that this had given her more confidence in her parenting abilities and had made family mealtimes much less stressful.

Dietary Repertoire

The foods that Jordan's parents reported him to eat from each food group during pre-intervention and follow-up interviews are displayed in Table 6. Jordan's parents reported that he ate 16 foods before the intervention and 22 foods at follow-up. They stated that he ate two new foods from the grains group, three from the vegetable group and one from the dairy group. One of the foods (mashed potato) was on the list his parents had outlined at the beginning of the study as foods they would like to introduce. His mother reported that if she gave him peas he would eventually eat them, but it would be a struggle. However, he was happy to eat both peas and corn if they were mixed into his mashed potato.

Table 6.
Jordan's Reported Dietary Repertoire at Pre-Intervention and Follow-Up.

Food Group	Pre-Intervention	Follow-Up
Grains:	GF bread GF corn flakes	GF bread GF corn flakes GF pancakes GF crisp bread
Vegetables:	Popcorn Potato wedges	Popcorn Potato wedges Mashed potato (with peas and corn) Roast potato Mixed vegetable patties
Fruits:	Raisins Banana	Raisins Banana
Dairy:	Soy milk Soy cheese	Soy milk Rice milk Cheese
Protein:	Steak Chicken GF sausage Bacon Eggs Fish GF baked beans Mince	Steak Chicken GF sausage Bacon Eggs Fish GF baked beans Mince

Family Quality of Life

Jordan's parents' total and subscale FQOL scores were obtained during baseline and post-intervention. These are displayed in Table 7. Jordan's mother's total FQOL score increased slightly

Table 7.
Jordan's Parents' Total and Subscale FQOL Scores at Baseline and Post-Intervention.

	Mother		Father	
Scale	**Baseline**	**Post-intervention**	**Baseline**	**Post-intervention**
Family Interactions	5.00	5.00	5.00	3.67
Parenting	4.83	4.67	4.83	4.17
Emotional Well-being	4.25	4.00	4.75	2.50
Physical/Material Well-being	4.40	4.80	5.00	4.60
Disability-Related Support	4.75	5.00	4.25	5.00
Total	4.68	4.72	4.80	4.00

between baseline and post-intervention. Her average scores increased for two subscales (Physical/Material Well-being and Disability-Related support), decreased for two subscales (Parenting and Emotional Well-being) and remained the same for one subscale (Family Interactions).

Jordan's father's total FQOL score decreased from baseline to post-intervention, indicating that his satisfaction with his family's quality of life had dropped. His average scores decreased significantly for four of the subscales and increased for one subscale (Disability-Related support) between baseline and post-intervention.

Social Validity

The Goodness-of-Fit Survey mean score was calculated for both Jordan's parents at baseline and post-intervention. His mother's mean score decreased slightly from baseline (M = 4.75) to post-intervention (M = 4.65). Her scores suggest that both before and after going through the intervention process she felt that the intervention fitted very well within her family life. At post-intervention, she rated the plan as having been very effective. Jordan's father's mean score also decreased a little from baseline (M = 4.6) to post-intervention (M = 4.3). This indicates that before the intervention he felt that the plan fitted very well within the context of his family, and after the intervention he still felt that it fit well. He rated the intervention as very effective at post-intervention.

Discussion

Jordan's mother was able to introduce peas into his diet during the intervention. She was also able to introduce orange, although she later stopped giving it to him as he had begun to vomit after eating it. During the last session of the intervention she conducted a probe of his eating behaviours with apple and showed that she could get him to eat a small piece. At follow-up, the only food Jordan would eat during the parent session was peas. However, his mother reported in the interview that if she gave him peas during family meals he would struggled to eat them calmly. Preference assessments revealed that Jordan's preference for peas, apples, rice and mashed potatoes did not increase during intervention or at follow-up. He showed a small increase in his preference for orange during the first intervention preference session, but it was not possible to measure his preference for this food during the rest of the preference sessions as it was dropped from the intervention. Jordan's parents both reported that they believed the intervention was very effective and that the plan was a good fit for their family. His mother's perception of family quality of life showed little change between baseline and post-intervention. However, Jordan's father's perception of his family's quality of life appeared to decline after the intervention.

CHAPTER 5

WILLIAM AND HIS FAMILY

The third case in the present study involved a 6-year old boy who was the younger of two children. Both his parents chose to participate in the intervention, which began in May 2011.

Method

Participants

William was a New Zealand boy of European decent diagnosed with ASD. He was in his second year at a local mainstream primary school and lived at home with his parents and a brother who also had ASD. Verbal language was his primary form of communication, although it was delayed and had only emerged when he was four years old. William's parents reported that when he was first introduced to solids he was a good eater and would try almost anything. However from the age of three years old, his diet became increasingly restricted. He began to selectively eat certain foods at a high frequency until he tired of them and refused to eat them anymore. His parents said that they did not realise what was happening until his diet had become very restricted.

William's parents had a consistent meal time routine in place where the family sat down to eat together. William ate bread, pasta, cereal, milk, cheese and yoghurt. With a lot of encouragement from his parents he also ate some meats. He occasionally ate some mandarin and the only vegetables he ate were corn and hot potato chips. In the past, his parents had tried strategies like showing him pictures of what he would be given for dinner, putting nonpreferred foods on his plate, modelling eating, placing nonpreferred foods in his mouth, giving him lots of attention during the meal, and trying to ignore his food refusal. However, none of these strategies seemed to work and William would protest, push the food off his plate, leave the table and expel any nonpreferred foods that were put in his mouth.

Assessment

Functional assessment: As discussed in Chapter 2, a functional assessment was conducted in order to ascertain the probable function of William's food refusal behaviours. The results of this

assessment suggested that his food selectivity was maintained through the negative reinforcement of his escape behaviours. This information was used to guide the design of William's intervention.

Preference assessment: Preference assessments were conducted in the manner described in Chapter 2. However, William refused to try any of the foods during baseline preference sessions, so a preference hierarchy was initially constructed based on his disruptive behaviours. That is, the food with the most disruptive behaviours was deemed to be the least preferred. This hierarchy (in order of preference) was orange, carrot, banana, broccoli, and potato (boiled). However, after reviewing the preference hierarchy, William's parents strongly felt that it did not reflect William's actual preferences. They constructed a new hierarchy by ordering the foods from those they thought William would be most likely to try to those that he would be least likely to try. The new hierarchy (in order of preference) was orange, banana, potato, carrot and broccoli. This hierarchy was used to guide the order in which foods were introduced during intervention. His parents selected raisins as his control preferred food. Preference assessments continued throughout the intervention and a follow-up preference session was conducted four months post-intervention.

Parent Intervention

William's parents chose to run the intervention in the afternoon before his evening meal. Initially William's mother introduced the intervention and later trained his father how to do it. The main strategies they used during the intervention were the same as those discussed in Chapter 2. In addition, a simplified behaviour shaping procedure was used to teach William to eat the targeted foods. William's criterion behaviours were licking the orange and then eating the orange. During each intervention session, one of William's parents presented him with a 1 cm^2 piece of the first target food (orange) five times in a row. Each time he engaged in the targeted behaviour, his parents would give him praise and a token showing an image of a natural disaster (e.g. tornadoes). When he had earned all five of his tokens, William was allowed access to a preferred activity such as playing on the computer, the Xbox or the television.

When William complied with criterion behaviour for 80% of trials and engaged in disruptive behaviours on less than 20% of trials for two consecutive sessions the next behaviour in the shaping list was introduced. Once he had mastered eating the food (the final criterion behaviour), the amount

of food he was required to eat before receiving reinforcement was gradually increased. Due to time constraints, only orange and banana were specifically targeted during intervention. A follow-up parent session was conducted four months post-intervention.

Results

Preference Assessment

The percentage of trials in which William engaged in food acceptance during baseline, intervention and follow-up preference assessments was calculated for each food. This data is displayed for the control food (raisin), orange, banana and potato in Figure 7.

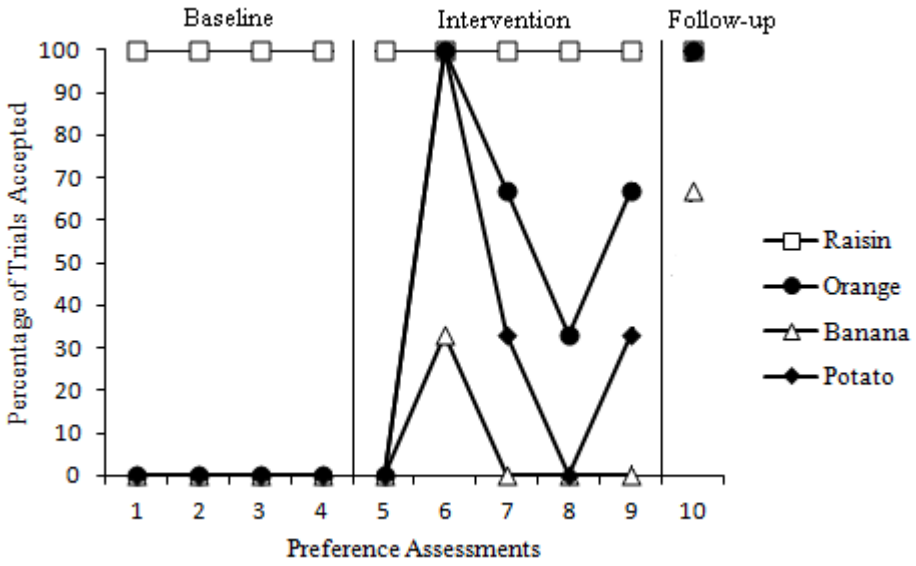

Figure 7. Percentage of trials in which William engaged in acceptance for three nonpreferred and one control food during (a) baseline, (b) intervention and (c) follow-up preference assessments.

During baseline preference assessments, William refused to eat any of the nonpreferred foods. He accepted raisins during 100% of trials for all sessions. During intervention preference assessments, his acceptance of orange (M = 53.4%), banana (6.6%) and potato (33.2%) increased, although his consumption of these foods was variable. Interestingly, his acceptance of potato was higher than that of banana, even though potato was never targeted during intervention. During the follow-up preference session, William accepted potato during 100% of trials and banana during 67% of trials. He also accepted orange during 100% of trials. However it was noted that he insisted on peeling all

the skin off the orange before he ate it. His acceptance of carrot and broccoli remained at zero throughout baseline, intervention and follow-up.

The average percentage of trials in which William engaged in disruptive behaviours for each food was calculated for baseline, intervention and follow-up and displayed in Figure 8.

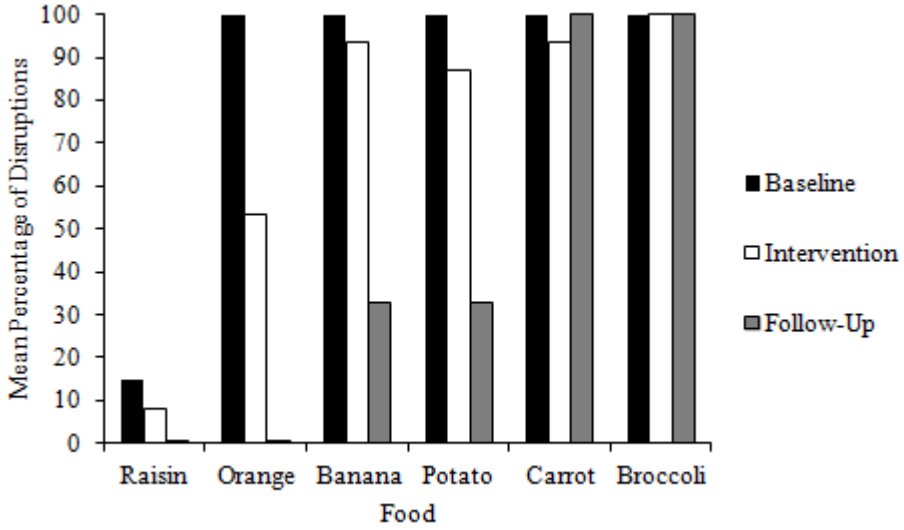

Figure 8. Mean percentage of trials in which William engaged in disruptive behaviours during (a) baseline, (b) intervention and (c) follow-up.

This data shows that the average percentage of trials in which disruptive behaviours occurred remained low for raisin throughout all phases of the study, and showed a decrease across intervention and follow-up. With the exception of broccoli, his mean percentage of disruptive behaviours dropped from baseline to intervention for all nonpreferred foods. During the follow-up preference session, William's percentage of disruptive behaviours dropped further still for orange, banana and potato. However, it remained the same for Broccoli and returned to baseline levels for carrot.

Parent Intervention Data

The percentage of trials in which William engaged in food acceptance and disruptive behaviours during parent intervention sessions was calculated for both orange and banana. This data is displayed in Figure 9. William engaged in acceptance during 100% of trials in each session of the 'lick' phase and did not engage in any disruptive behaviours upon the introduction of the orange

intervention. The criterion behaviour was raised to eating the orange in Session 5 and the criterion amount he was required to eat in order to gain reinforcement was raised to 2 cm² in Session 7, to one

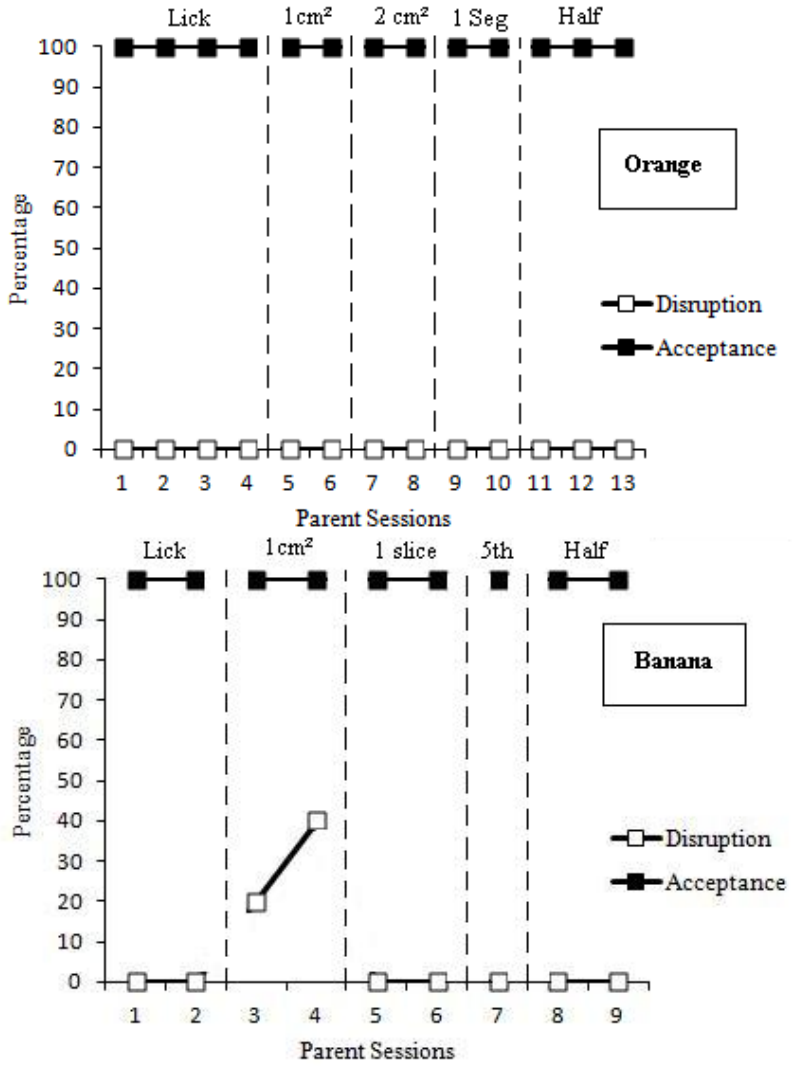

Figure 9. Percentage of trials in which William engaged in (a) food acceptance and (b) disruptive behaviours during parent intervention sessions.

segment in Session 9 and to half an orange in Session 11. Tokens were gradually faded out of the intervention over Sessions 11, 12, and 13. During the last session William consumed half an orange without being given any tokens. William engaged in acceptance during 100% of trials throughout all sessions of the orange intervention. He did not engage in any disruptive behaviours.

William also immediately complied with instructions during 100% of trials of the 'lick' phase when banana was targeted. The criterion behaviour was raised to eating the banana in Session 3 and the criterion amount was raised to 1 slice in Session 5, to a fifth of a banana in Session 7 and to half a

banana in Session 8. His disruptive behaviours briefly increased during Sessions 3 and 4 when the criterion behaviour changed from 'lick' to 'eat', but returned to zero for the remainder of the parent intervention sessions. Tokens were completely faded out of the last two sessions of the intervention.

During the follow-up parent session, William consumed a piece of orange and potato without engaging in any disruptive behaviours. He also consumed a piece of banana, although he protested once and gagged. He protested when presented with the carrot and broccoli and refused to eat them. He did, however, lick and then nibble a small piece of each when his father encouraged him to do so. His parents reported in the follow-up interview that they found the behaviour shaping strategy the most helpful of all the strategies they had learned.

Dietary Repertoire

The foods that William's parents reported him to eat from each food group during pre-intervention and follow-up interviews are displayed below in Table 8.

Table 8.
William's Reported Dietary Repertoire at Pre-Intervention and Follow-Up.

Food Group	Pre-Intervention	Follow-Up
Grains:	Pasta	Pasta
	Bread	Bread
	Noodles	Noodles
	Cocoa Pops	Cocoa Pops
	Cherrios	Cherrios
		Cornflakes
		Rice (occasionally)
Vegetables:	Corn	Corn
	Potato chips	Potato chips
		Boiled Potatoes
		Peas
Fruits:	Mandarin (occasionally)	Mandarin
		Orange
		Banana
Dairy:	Milk	Milk
	Cheese	Cheese
	Yoghurt	Yoghurt
Protein:	Fish (occasionally)	Fish
	Chicken	Chicken
	Beef steak	Beef steak
	Bacon	Bacon
	Baked Beans	Baked Beans
		Mince

This table shows that the number of foods in William's dietary repertoire increased from 16 foods pre-intervention to 23 foods at follow-up. William's parents reported that he ate two new foods from the grains group, two new foods from the vegetable group, two new foods from the fruit group and one new food from the protein group. In total, three of the new foods (orange, banana and potato) were from the list of foods William's parents had outlined at the beginning of the study as foods they would like to target during intervention. They stated that they did not think that William really liked banana, but that he would eat it when they asked him to. They reported that he still refused to eat carrot and broccoli, but that they were persisting with the strategies and could now get him to take small nibbles of each. William's parents claimed that they had also used the strategies from the intervention to introduce fish oil. They reported that William would now consume a full portion of fish oil independently and no longer required reinforcement for doing so.

Family Quality of Life

The mean total FQOL score was calculated for both William's parents at baseline and post-intervention. This information is displayed in Table 9. These scores indicated that William's

Table 9.
William's Parents' Total and Subscale FQOL Scores at Baseline and Post-Intervention.

	Mother		Father	
Scale	**Baseline**	**Post-intervention**	**Baseline**	**Post-intervention**
Family Interactions	4.00	4.00	4.00	4.00
Parenting	4.00	4.00	4.00	4.00
Emotional Well-being	3.75	4.00	4.00	4.00
Physical/Material Well-being	3.80	4.00	4.00	4.00
Disability-Related Support	3.75	4.00	4.00	4.00
Total	3.88	4.00	4.00	4.00

mother's mean FQOL score increased a little from baseline to post-intervention. Her average scores increased for three subscales (Emotional Well-Being, Physical/Material Well-being and Disability-Related Support) and stayed the same for two subscales (Family Interactions and Parenting). William's father's mean FQOL score remained the same for baseline and post-intervention. His average scores remained the same for all subscales.

Social Validity

The mean score for the Goodness-of-Fit Survey was calculated for both William's parents at baseline and post-intervention. His mother's mean scores increased from baseline (M = 4) to post-intervention (M = 4.8), suggesting that after going through the intervention process she felt that the intervention fitted very well within her family life. At post-intervention she rated the intervention as very effective. William's father's mean score during baseline (M = 3.95) and post-intervention (M = 4.05) indicated that he too felt the intervention plan fitted well with the context of his family. He rated the intervention as effective at post-intervention.

Discussion

During the intervention, William's parents were successfully able to introduce orange and banana into his diet. Preference assessments revealed that William's preference for orange, banana and potato increased over this time. At the four month follow-up, William accepted orange, banana and potato, and would nibble on carrot and broccoli when he was encouraged to do so. His parents reported that they had also introduced three additional foods to his diet as well as a dietary supplement (fish oil). The follow-up preference assessment indicated that William's preference for orange, banana and potato had increased relative to baseline and intervention. William's parents both reported that they believed the intervention was effective and that they found the behaviour shaping strategy to be the most useful of all the strategies they learned. Both parents' perceptions of family quality of life remained reasonably stable across baseline and post-intervention.

CHAPTER 5

TAYLOR AND HIS FAMILY

The fourth case involved a three year old boy, who was the younger of two siblings with ASD. Both of Taylor's parents took part in the study, which began in May 2011.

Method

Participant

Taylor was a New Zealand boy of European descent who had been diagnosed with ASD. He attended a mainstream preschool and lived at home with his parents and his sister (who also participated in the current study). Taylor had no verbal communication and used crying, pointing and physical guidance to communicate with his parents. His parents had begun to introduce visual aids to try and facilitate his communication. Taylor had developed feeding difficulties as an infant. He refused to be spoon fed from the age of eight months and had remained on finger food ever since. His parents reported that his diet had always been restricted and had shown little improvement over the years.

Taylor ate separately from his sister and his parents as they tended to get hungry at different times. His diet consisted of bread, dry cereals, crackers, fruit bars, cheese, and some processed meats. He refused to eat any fruits or vegetables. When presented with non-preferred foods Taylor tended to hit his parents, cry, and run away from the table. If he was spoon fed, his parents reported that he often gagged. They usually only gave him preferred foods but did not allow him to select which of these foods he could have for his evening meal. In the past, Taylor's parents had tried involving him in food preparation and modelling eating to encourage him to try nonpreferred foods. However, they reported that this had been ineffective.

Assessment

Functional assessment: As discussed in Chapter 2, a functional assessment was conducted in order to identify variables maintaining Taylor's food selectivity. The results of this assessment suggested that his food refusal was functioning as an escape behaviour maintained by negative reinforcement. It was hypothesized that Taylor's aversion to nonpreferred foods may also have been

due to some sensory problems. This hypothesis was based on reports from Taylor's parents that he disliked objects being placed in his mouth (e.g. a spoon or a toothbrush). Information from the functional assessment was used to guide the design of Taylor's intervention.

Preference assessment: Taylor's preference assessments were conducted in the manner described in Chapter 2. However, due to his young age and the fact that he struggled to stay calmly seated at the table, he was allowed a two minute break after every five trials. During the baseline preference assessments Taylor refused to eat all of the nonpreferred foods. He did, however, lick apple, banana and carrot on several occasions during two of the baseline preference sessions. After discussing the number of times he licked and engaged in disruptive behaviours for each food with his parents, a preference hierarchy was created. Taylor's list of target nonpreferred foods (in order of preference) were: banana, apple, carrot, banana flavoured yoghurt, and beef casserole. His parents selected a fruit bar as his control as they reported that this was a preferred food. Preference assessments continued throughout the intervention and a follow-up preference assessments was conducted four months after the end of the intervention.

Parent Intervention

Taylor's parents decided to run the intervention during his afternoon snack. Taylor's mother introduced the intervention and later trained his father how to do it. She presented a 1 cm^2 portion of the target food to Taylor five times each session. In between presentations she gave him a portion of his usual snack food (e.g. a fruit bar or sandwich). In addition to the strategies outlined in Chapter 2, she used a behaviour shaping procedure to teach Taylor to eat the non-preferred foods. His criterion behaviours were to lick the food, place the food in his mouth, nibble the food, and eat the food. Each time Taylor engaged in the target behaviour his mother praised him and gave him a Mickey Mouse token. When he had earned all five tokens he was allowed to access a preferred activity such as playing on the swing, reading a story, or going for a bike ride.

If Taylor became upset his mother was taught to reduce the difficulty of the task by asking him to engage in the previous behaviour on his criterion behaviours list (e.g. licking the food instead of putting it in his mouth). This was done to increase Taylor's compliance momentum and to increase contact with the reinforcement contingency. When he was able to calmly comply with this request for

two consecutive trials his mother raised the criterion once more. Trials in which a criterion 'reversal' occurred were scored as refusals. If Taylor was unable to calm down after 15 minutes, his mother terminated the session and prevented him from accessing his preferred activity or another food for 30 minutes.

When Taylor had mastered the final criterion behaviour (eating), the criterion amount of food he was required to eat in order to access reinforcement was doubled. Due to time constraints, only banana and apple were specifically targeted during the intervention phase. A follow-up parent session was conducted four months after the end of the intervention.

Results

Preference Assessment

The percentage of trials in which Taylor accepted each of the foods was calculated during baseline, intervention and follow-up preference assessments. Figure 10 shows the percentage of trials in which Taylor accepted fruit bar (the control food), banana and apple during each phase of the intervention. In baseline preference assessments, Taylor's acceptance of the control food (fruit bar)

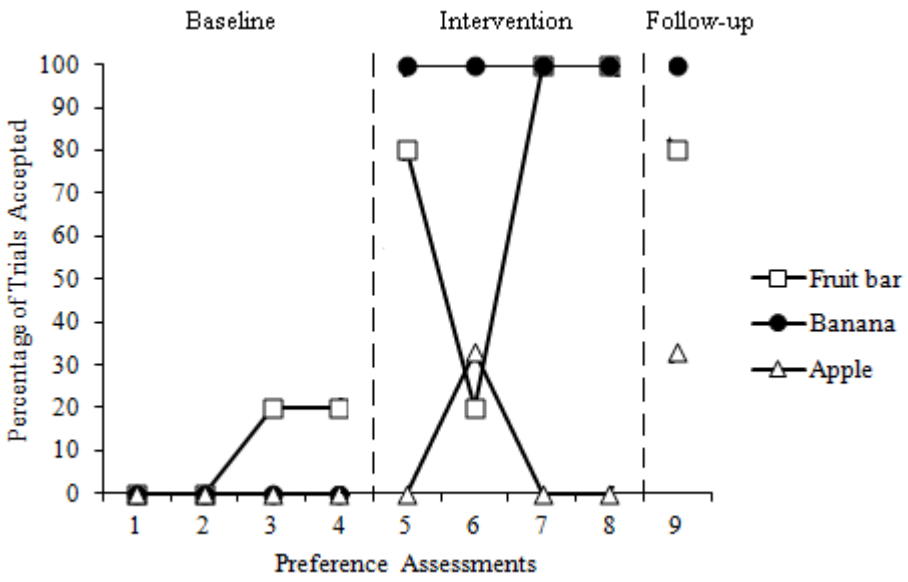

Figure 10. Percentage of trials in which Taylor engaged in acceptance for two nonpreferred and one control food during (a) baseline, (b) intervention and (c) follow-up preference assessments.

was variable and low (*M* = 10%). He refused to accept any of the five nonpreferred foods during this phase. During intervention preference assessments, Taylor's acceptance of fruit bar increased (*M* = 75%) but continued to fluctuate. His acceptance of banana immediately increased to 100%. His acceptance of apple briefly increased to 33% during the second intervention preference assessment (after it had been targeted during parent intervention sessions). However, his acceptance of apple then returned to zero for the remainder of the intervention phase. He did not accept carrot, yoghurt or beef casserole at any stage throughout the intervention phase. At the follow-up preference assessment, Taylor accepted banana during 100% of trials, fruit bar during 80% of trials and apple during 33% of trials. He did not accept carrot, yoghurt or beef.

The percentage of trials in which disruptive behaviours occurred for each food was also calculated during preference assessments. Figure 11 displays the average percentage of trials that Taylor engaged in disruptive behaviours for baseline, intervention and follow-up preference assessment sessions for each food. The average percentage of trials in which disruptive behaviours

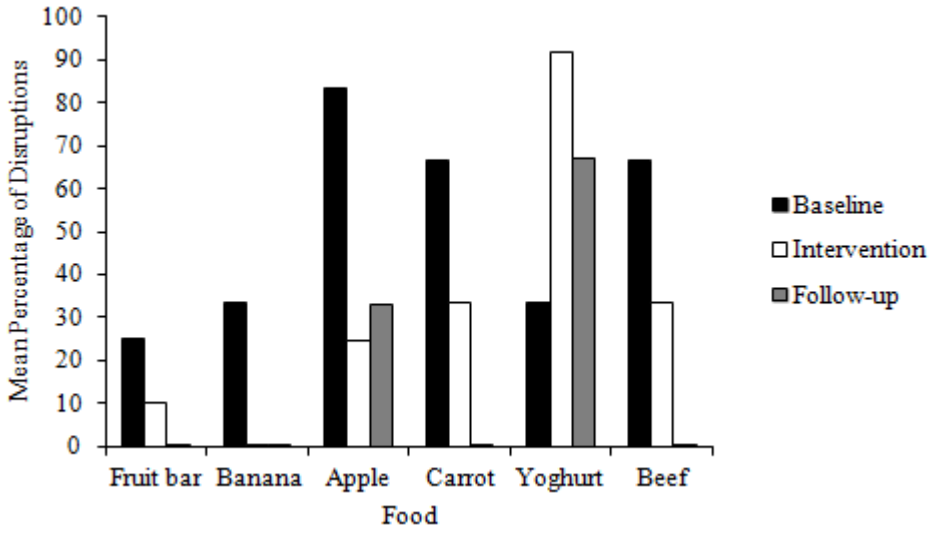

Figure 11. Percentage of trials in which Taylor engaged in disruptive behaviours for each food during (a) baseline, (b) intervention and (c) follow-up preference assessments.

occurred decreased between baseline and intervention for all foods except yoghurt. At the follow-up preference assessment, the percentage of trials in which disruptive behaviours occurred was zero for fruit bar, banana, carrot and beef. The percentage of disruptive behaviours for yoghurt was lower than

the average percentage during intervention, although it was still much higher than baseline levels. Taylor's percentage of disruptive behaviours increased relative to intervention for apple, but still remained well below the average percentage during baseline.

Parent Intervention Data

The percentage of trials in which Taylor engaged in acceptance and disruptive behaviours when presented with banana or apple were calculated for each parent intervention session. This data is presented in Figure 12. Taylor immediately complied with the instruction to lick the banana during

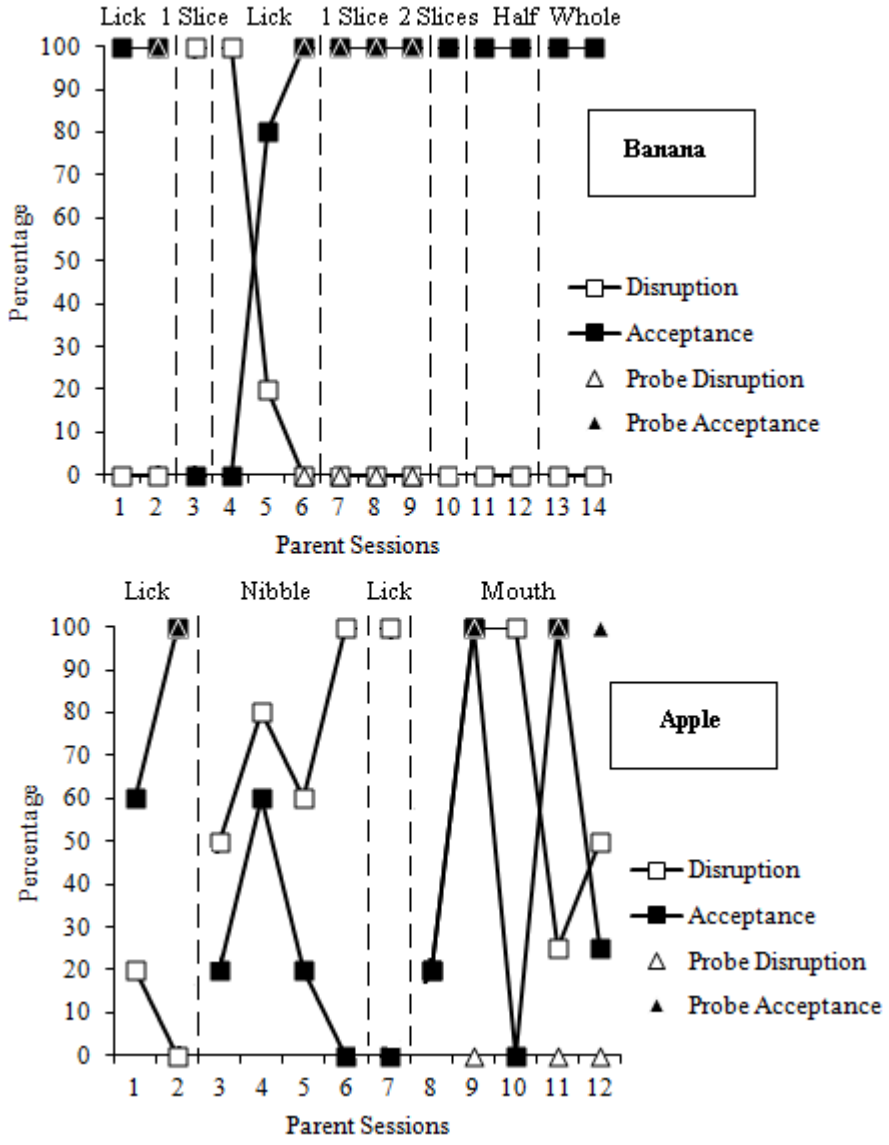

Figure 12. Percentage of trials in which Taylor engaged in (a) food acceptance and (b) disruptive behaviours during parent intervention sessions.

100% of trials following the introduction of the intervention. During the last trial of Session 2, his mother conducted a probe of a later criterion behaviour (eating one slice). Taylor accepted the banana during this probe, so his mother attempted to change the criterion behaviour to eating a slice of banana in the next session. However, he would not accept any banana during Session 3 and his disruptive behaviours increased to 100%. In Session 4, his mother returned to simply instructing him to lick the banana but Taylor also refused to comply with this instruction. Nevertheless, over the next two sessions his compliance increased and his disruptive behaviours returned to zero. During the last three trials of Session 6, his mother once again conducted a probe to see if he would eat a slice of banana. As Taylor accepted the banana during each of these trials, the criterion behaviour was raised to eating one slice in Session 7. Throughout this phase, Taylor's mother conducted probes each session to see if he would eat two slices of banana. She gradually increased the number of trials in which he was required to eat two slices. That is, Taylor had to accept two slices of banana during the final trial of Session 7, the final two trials of Session 8, and the final three trials of Session 9. During Session 10, Taylor accepted two slices of banana during all five trials. The criterion amount he had to eat was raised to half a banana in Session 11 and to a whole banana in Session 14. Taylor's percentage of acceptance remained at 100% and disruptive behaviours at zero throughout both these phases. Tokens were successfully faded out of the last two sessions.

When apple was introduced to the intervention, Taylor only complied with instructions to lick the food during 60% of trials. However, his compliance increased to 100% in Session 2 and his disruptive behaviours remained low throughout both sessions. During the last trial of this session, his mother conducted a probe to see if Taylor would nibble the apple. As he complied with this instruction, she introduced the 'nibble' phase in the next session. However, over the next four sessions Taylor's disruptive behaviours gradually increased to 100% and his acceptance eventually decreased to zero. His mother returned him to the 'lick' phase in Session 7. Although he did not comply with this instruction during any of the trials, she decided to move him on to placing the apple in his mouth in Session 8. Throughout the 'in mouth' phase, Taylor's compliance fluctuated greatly (between zero and 100%). In Session 9, he complied with instructions to place the apple in his mouth during the first four trials, so his mother conducted a probe of 'nibble' for the fifth trial. Although he

complied during the probe, he returned to refusing to place the apple in his mouth in any of the trials of the next session. During the final trial of the last two sessions of the intervention, his mother conducted additional 'nibble' probes. During both probes, Taylor complied with instructions and nibbled on the apple.

During the follow-up parent session, Taylor complied with instructions to eat banana. He refused to eat apple, carrot or yoghurt, although he did comply with instructions to nibble the apple and lick the carrot. He did not engage in any disruptive behaviours when presented with banana, apple or carrot but protested twice when presented with yoghurt. Unfortunately data could not be collected on his acceptance of beef casserole as this food was not available at the time of the follow-up session. However, his parents reported that he still refused to eat beef casserole. His parents reported that the most useful strategy they had learned during the study was the behaviour shaping strategy. Taylor's mother reported that she had learned to have more patience and not to expect too much too soon. She also reported that they had been using a similar 'small steps' approach to teach Taylor behaviours other than eating, such as brushing his teeth.

Dietary Repertoire

The foods that Taylor's parents reported him to eat from each food group during pre-intervention and follow-up interviews are displayed below in Table 10. This table shows that the

Table 10.
Taylor's Reported Dietary Repertoire at Pre-Intervention and Follow-Up.

Food Group	Pre-Intervention	Follow-Up
Grains	Bread	Bread
	Wheatbix	Wheatbix
	Corn flakes	Corn flakes
	Fruit bars	Fruit bars
	Crackers	Crackers
		Pretzels
Vegetables	None	None
Fruits	None	Banana
		Apple (small amounts)
Dairy	Cheese	Cheese
Protein	Sausages	Sausages
	Chicken nuggets	Chicken nuggets
	Fish fingers	Fish fingers

number of foods in Taylor's dietary repertoire increased from nine foods before the beginning of the intervention to 12 foods at follow-up. Two of the new foods (apple and banana) were on the list of foods Taylor's parents had outlined as foods they would like to introduce at the beginning of the study. They reported that banana was now one of Taylor's favourite foods and that he frequently requested it. While apple was not a favourite food, they said that he would eat it in small portions.

Family Quality of Life

Taylor's parents' total and subscale FQOL scores were calculated during baseline and post-intervention (1 = very dissatisfied, 5 = very satisfied). These scores are given in Table 11. Taylor's

Table 11.
Taylor's Parents' Total and Subscale FQOL Scores at Baseline and Post-Intervention.

	Mother		**Father**	
Scale	**Baseline**	**Post-intervention**	**Baseline**	**Post-intervention**
Family Interactions	4.00	3.00	4.17	4.17
Parenting	3.83	4.00	4.17	4.00
Emotional Well-being	2.50	2.25	3.50	2.75
Physical/Material Well-being	3.60	3.60	4.20	4.00
Disability-Related Support	4.25	4.25	4.00	4.00
Total	3.68	3.44	4.04	3.84

mother's total FQOL score decreased slightly between baseline and post-intervention. This suggests that her satisfaction with her family's general quality of life decreased a little over this time. Her average scores decreased for two of the subscales (Family Interactions and Emotional Well-being), remained the same for two of the subscales (Physical/Material Well-being and Disability-Related Support) and increased for one of the subscales (Parenting). The most significant change was the decrease in her Family Interactions subscale score. Taylor's father's total FQOL score also decreased a little between baseline and post-intervention. This suggests that he too was a little less satisfied with his family's general quality of life at post-intervention. However, this decrease was relatively minor. His average scores decreased for four of the subscales and remained the same for one subscale (Disability-Related support). The most significant change was in his Emotional Well-being subscale score.

Social Validity

The Goodness-of-Fit Survey mean score was calculated for both Taylor's parents at baseline and post-intervention. His mother's mean score decreased slightly from baseline (M = 4.65) to post-intervention (M = 4.5). Nonetheless, her scores indicate that both before and after the intervention she felt that the plan fitted very well within her family life. She also rated the intervention plan as very effective. Taylor's father's mean score increased a little from baseline (M = 4.2) to post-intervention (M = 4.3). His scores indicate that both before and after the intervention he felt that the plan fitted well within the context of his family. He rated the intervention as effective at post-intervention.

Discussion

Taylor's parents were able to introduce banana into his diet during the intervention. At follow-up, Taylor continued to consume banana and would nibble on small amounts of apple. Taylor's preference for banana and apple appeared to improve as shown by increases in his acceptance of these foods during preference assessments. However, while this trend was striking for banana it was only slight for apple. This was confirmed by his parents who reported that banana had become one of his favourite foods but that he still did not appear to like apple very much. Both parents reported that they believed the intervention was effective and that the intervention plan was a good fit for their family. Their overall perceptions of family quality of life changed little between baseline and post-intervention, although Taylor's mother showed a decline in her satisfaction with family interactions and his father showed a decline in his satisfaction with the family's emotional well-being. His parents reported at follow-up that they continued to use the strategies they had learned during the intervention and intended to carry on doing so in the future.

CHAPTER 7

CHRISTINA AND HER FAMILY

The fifth and final case involved a five year old girl, who was the older sister of the fourth participant, Taylor. Both her parents took part in the study, although only her mother participated in intervention training. The intervention began in June 2011.

Method

Participant

Christina was a New Zealand girl of European descent who had been diagnosed with Autism. She lived at home with her parents and younger brother (Taylor) and was in her first year at a mainstream primary school. She communicated verbally although her language was delayed. Her parents reported that she was a good feeder as a baby but suddenly became extremely food selective at the age of two years. She suffered from constipation, so her parents tried to crush her laxative medication up and hide it in her food. They believe that she found the taste of the medication aversive and consequently refused to try those foods anymore. They also reported that she selectively consumed some foods at a high frequency, but later tired of them and refused to eat them. Her parents had become very concerned as her weight had dropped slightly from what it had been two years before.

Christina ate her meals separately from her brother and parents and sometimes chose to eat on the couch or in her playhouse. Her diet consisted of bread (cut into circles), banana flavoured yoghurt, uncooked pasta, potato fries and cheese. Her parents rarely asked her to eat non-preferred foods because when they did she protested, screamed, cried and kicked. They had tried to encourage her to try nonpreferred foods by getting her to help them with food preparation. However, when they offered her a nonpreferred food she refused to try it and asked them to eat it instead. Soon after the beginning of the study, Christina was referred to a dietician. She had her first appointment shortly after the end of the intervention.

Assessment

Functional assessment: A functional assessment (as described in Chapter 2) was conducted in order to ascertain the function of Christina's food refusal behaviours. The results of this assessment suggested that her food selectivity was maintained by negative reinforcement of food refusal behaviours. This information was used to guide the design of her intervention.

Preference assessment: Preference assessments were carried out as described in Chapter 2. During baseline preference assessments Christina nibbled small flakes of pastry off one nonpreferred food (mince pie), so it was placed at the top of her preference hierarchy (most preferred). She also licked all other nonpreferred foods each time she was presented with them. As she only engaged in disruptive behaviours once for one food (banana), the rest of the foods were ranked according to Christina's parents' estimate of her preference. Her parents felt that banana would be more appealing to Christina than peas or corn. Thus, the target foods (in order of preference) were mince pie, apple, banana, peas and corn. Preference assessments were conducted throughout the intervention phase and a follow-up preference assessment was conducted four months after the end of the intervention.

Parent Intervention

Christina's parents chose to run the intervention as part of her afternoon snack. Her mother introduced the intervention with the view of training her father to implement it at a later date. During each intervention session, Christina's mother presented a 1 cm^2 piece of the first target food (mince pie) to Christina five times. Between each presentation she gave Christina a portion of her usual preferred snack. In addition to the strategies outlined in Chapter 2, she used a behaviour shaping procedure to teach Christina to eat the target food. Christina's criterion behaviours were to lick the food, place the food in her mouth, nibble the food and finally to eat the food. Each time Christina engaged in the targeted behaviour her mother rewarded her with praise and a dog token. When Christina had earned all five of her tokens, she was allowed access to her preferred activity, which included playing on the computer, playing on the swing, reading a story or going for a bike ride.

If Christina became upset her mother was taught to reduce the difficulty of the task by reverting to the previous behaviour on the shaping list. For example, if Christina became distressed when she was asked to place the food in her mouth and was unable to calm down, her mother reverted

to asking her to lick the food. Trials in which a criterion 'reversal' occurred were scored as refusals. When Christina was able to calmly comply with this request for two presentations in a row her mother raised the criterion back up to placing the food in her mouth. If Christina was unable to calm down after 15 minutes her mother terminated the session and prevented her from accessing her preferred activity or another food for 30 minutes.

When Christina had met the mastery criterion (80% compliance and less than 20% disruptive behaviours for two consecutive sessions) for the final behaviour in the shaping list (eating), the amount of food she had to eat in order to access reinforcement was gradually increased. Due to time constraints, only the first two foods in the preference hierarchy (mince pie and apple) were introduced during the intervention. A follow-up parent session was conducted four months after the end of the intervention.

Results

Preference Assessment

The percentage of trials in which food acceptance occurred during baseline, intervention and follow-up preference assessments was calculated for each food. This data is displayed for the control food (white jelly beans), mince pie and apple in Figure 13. During baseline preference assessments,

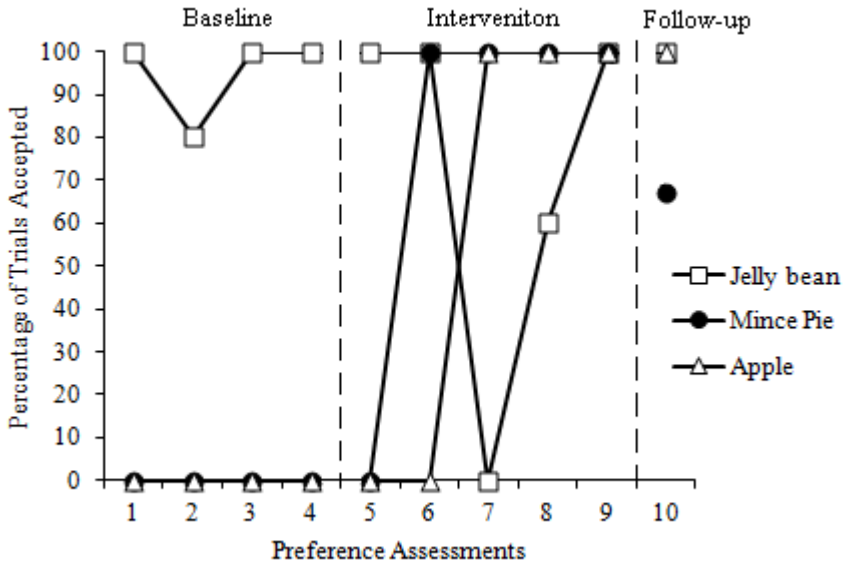

Figure 13. Percentage of trials in which Christina engaged in acceptance for two nonpreferred and one control food during (a) baseline, (b) intervention and (c) follow-up preference assessments

Christina did not accept any of the nonpreferred foods. She consumed jelly beans during most trials (*M* = 95%) throughout the baseline phase. During the intervention phase, she accepted jelly beans during 100% of trials for all assessments except Assessments 7 and 8 (*M* = 72%). She began consuming mince pie during 100% of trials from Assessment 6 onwards (*M* = 80%). From Assessment 7, she began consuming apple during 100% of trials (*M* = 60%). She did not consume any banana, peas or corn during any intervention preference assessments. During the follow-up preference assessment, Christina consumed jellybeans and apple during 100% of trials. She appeared reluctant to eat the mince filling of the pie, although she did so during 67% of trials. She refused to try banana, peas or corn at all.

Data on Christina's disruptive behaviours was also collected during the preference assessments. The mean percentage of trials in which disruptive behaviours occurred during baseline, intervention and follow-up is presented for each food in Figure 14. During baseline preference

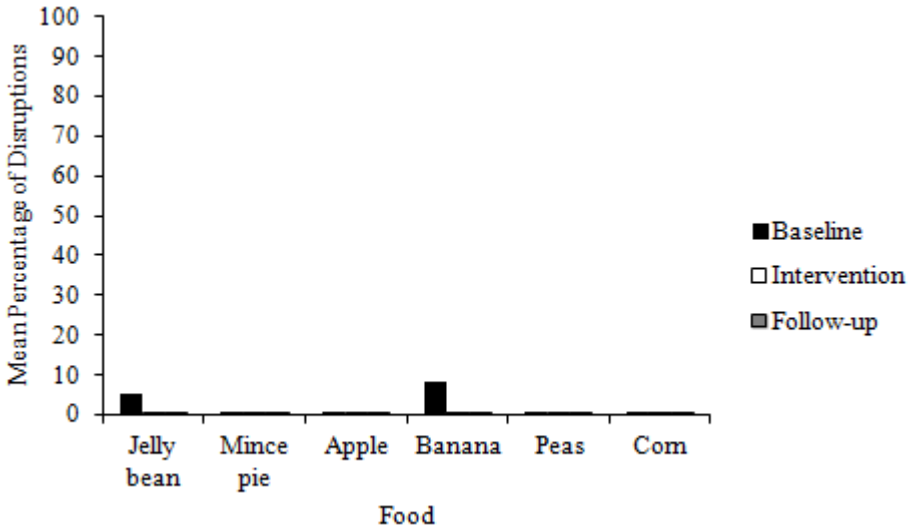

Figure 14. Mean percentage of trials in which Christina engaged in disruptive behaviours for each food during (a) baseline, (b) intervention and (c) follow-up preference assessments.

assessments, Christina engaged in disruptive behaviours in an average of 5% of trials when presented with jelly beans and 8.3% of trials when presented with banana. She did not engage in any disruptive behaviours when presented with mince pie, apple, peas or corn. Christina did not engage in disruptive behaviours when presented with any of the foods during intervention or follow-up preference assessments.

Parent Intervention Data

The percentage of trials that Christina engaged in food acceptance or disruptive behaviours was calculated for parent intervention sessions targeting mince pie and then apple. This data is presented in Figure 15. Christina complied with instructions to lick the mince pie during 100% of

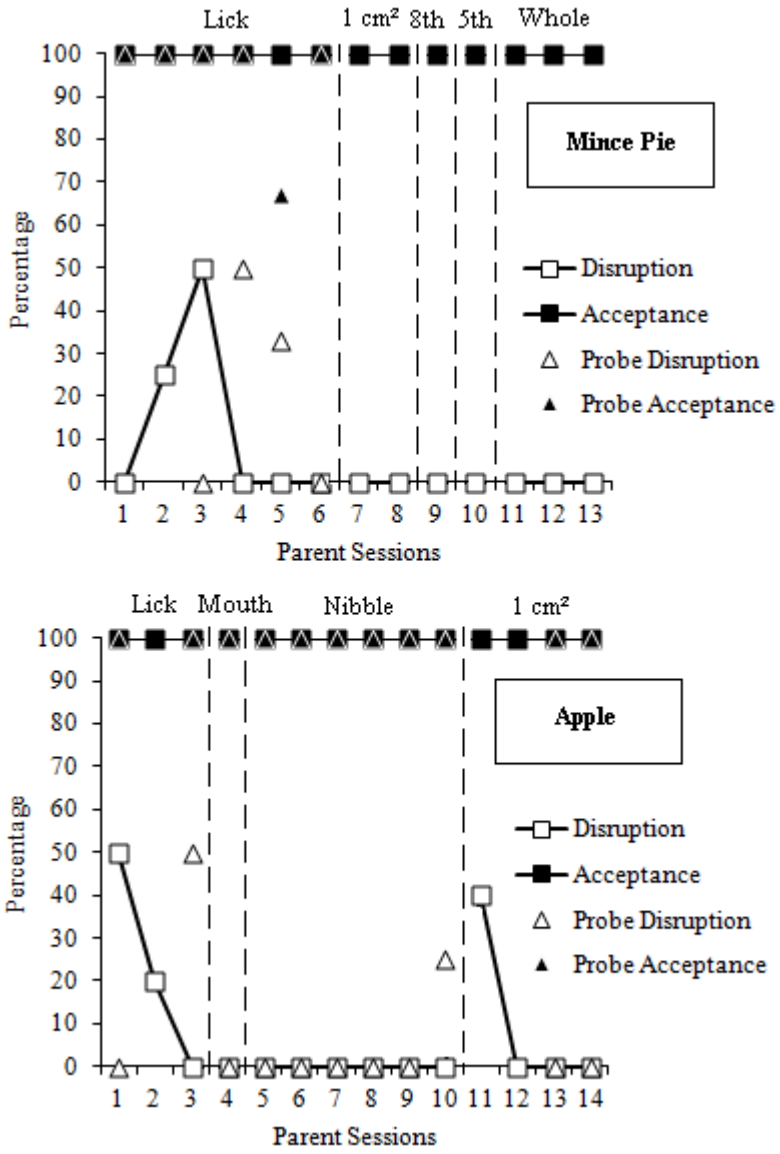

Figure 15. Percentage of trials in which Christina engaged in (a) food acceptance and (b) disruptive behaviours during parent intervention sessions.

trials throughout the first phase of the intervention. The percentage of trials in which disruptive behaviours occurred increased during Sessions 2 and 3, but remained at zero during the rest of the intervention. Her mother conducted a probe to see if she would eat a 1 cm² piece of pie on the last

trial of each of the first three sessions, to which Christina always complied. During the last three sessions of the phase, her mother gradually increased the number of trials in which Christina was required to eat the pie. That is, in order to access reinforcement, Christina had to eat the pie during the last two trials of Session 4, the last three trials of Session 5, and the last four trials of Session 6. During Sessions 7 and 8, Christina consumed the pie during all five trials. The criterion amount she was required to eat was raised to an eighth of the pie (approximately 2 cm^2) in Session 9 and to a fifth of a pie in Session 10. Christina consumed a whole mince pie in Sessions 11, 12 and 13. Tokens were successfully faded out of the last session.

When apple was introduced, Christina complied with 'lick' instructions during 100% of trials during the first three sessions. Her disruptive behaviours decreased from 50% of trials in Session 1 to zero in Session 3. Her mother conducted probes to see if Christina would put the apple in her mouth in Sessions 1 and 3. Christina complied during both probes, so the 'mouth' phase was introduced in Session 4. Her mother conducted a 'nibble' probe during the last three trials of this session. As Christina complied during all probe trials, the 'nibble' phase was introduced in Session 5. Throughout this phase, Christina's compliance remained at 100%, and her disruptive behaviours at zero. Her mother conducted probes to see if she would eat a 1 cm^2 piece of apple during the last two trials of the first four sessions of the 'nibble' phase. Christina accepted the apple during each of these probes. During the last two sessions of the 'nibble' phase, her mother gradually increased the number of trials in which she was required to eat the apple. That is, Christina consumed apple during the final three trials of Session 9 and the last four trials of Session 10. Christina consumed apple during all five trials of the next two sessions. During the last two trials of Session 13 and 14, her mother conducted probes to see if Christina would eat 2 cm^2 pieces of apple. Christina accepted the apple during 100% of these probe trials.

At the follow-up parent session, Christina accepted apple but refused to eat mince pie, banana or corn. Unfortunately, peas were not available during the follow-up session. Christina's mother reported that she had thought Christina would accept the pie, but said that the family had only recently returned from holiday and Christina had not been given mince pie for a while. With encouragement from her mother, Christina complied with instructions to put both banana and corn in her mouth. Her

mother reported that the most useful strategy she had learned during the intervention was behaviour shaping.

Dietary Repertoire

The foods that Christina's parents reported her to eat from each food group during pre-intervention and follow-up interviews are displayed in Table 12.

Table 12.
Christina's Reported Dietary Repertoire at Pre-Intervention and Follow-Up.

Food Group	Pre-Intervention	Follow-up
Vegetables	Potato fries	Potato fries
Fruit	None	Apple
Grains	Bread Pasta (uncooked)	Bread Pasta (uncooked)
Dairy	Cheese Yoghurt	Cheese Yoghurt
Proteins	None	Mince (pie)

The table shows that the number of foods in Christina's dietary repertoire increased from five foods at pre-intervention to seven foods at follow-up. Both of these additional foods were targeted during the intervention. Her mother also reported that since the beginning of the intervention Christina had tried crackers, carrots and potato chips. However, she still would not eat these foods consistently. Christina's mother reported that she could now consume up to a quarter of an apple. They had planned to increase this amount but had to put it on hold shortly after the end of the intervention as her dietician had recommended that they introduce a dietary supplement drink. Christina's mother reported that they introduced this by initially only giving Christina a very small amount to drink (5 mLs) and allowing her to access a preferred activity when she had all her tokens. Gradually they increased the amount she had to drink and faded out the rewards. At the time of the follow-up interview, Christina could consume a whole bottle of the dietary supplement and no longer required reinforcement. Her mother reported that she had gained approximately two kilograms since just before of the intervention.

Family Quality of Life

Christina's parents' total and subscale FQOL scores were calculated during baseline and post-intervention and are the same as those reported for Taylor in Chapter 6 (Table 11). These scores showed that their overall perceptions of family quality of life changed little between baseline and post-intervention. However, Christina's mother showed a decline in her satisfaction with family interactions and her father showed a decline in his satisfaction with the family's emotional well-being.

Social Validity

The Goodness-of-Fit Survey mean scores were calculated for both Christina's parents at baseline and post-intervention and are the same as those reported for Taylor in Chapter 6 (Table 12). These showed that both before and after the interventions the children's parents felt that the plan fitted well within the context of their family. Both parents reported that they believed the intervention had been effective.

Discussion

Christina's mother was able to introduce apple and savoury mince pie into her daughter's diet during the intervention. Christina's preference for these foods improved dramatically over this time. Four months after the end of the intervention Christina continued to consume apple, but refused to eat mince pie during the follow-up parent session. Christina's mother reported that she believed this was because the family had only recently returned from holiday and Christina had not been given pie for some time. Christina consumed pie during 67% of trials during the follow-up preference assessment, indicating that she maintained some partiality towards the food. However, it was noted that she consumed the pie very slowly and often picked pieces off of it, something she had not done since the early intervention sessions. In addition to mince pie and apple, Christina's mother had successfully introduced a dietary supplement drink using the strategies she had learned during the intervention. She reported that behaviour shaping was the most useful strategy she had learned. Both of Christina's parents reported after that they believed the intervention fit well within the context of their family and was effective. They showed little change in their overall perception of family quality of life. However, Christina's mother reported a decrease in her satisfaction with family interactions and her father reported a decrease in his satisfaction with the family's emotional well-being.

CHAPTER 8

GENERAL DISCUSSION

The present study had three aims. The first was to demonstrate the use of multi-component behavioural interventions in ameliorating the food selectivity of children with ASD. The second aim was to train parents to implement these interventions within the natural contexts of their homes. The third and final aim was to increase the children's preference for targeted foods so that food acceptance might occur in the absence of intervention strategies. All of the parents who participated in the current study were able to implement the interventions at home and introduce at least one nonpreferred food to their children's diets. Three of the five children (Thomas, William and Christina) learned to accept two foods. All of the children showed some improvement in their preference for the targeted foods. At follow-up, Jordan, William and Taylor demonstrated maintenance of all of the foods that had been introduced during their interventions. Thomas and Christina also demonstrated maintenance for some of the foods but refused to eat others. Parents of all of the children reported them to consume more foods at follow-up than they had before the beginning of the intervention.

Multicomponent Behavioural Interventions

All of the interventions in the present study shared some common strategies. These included repeated taste exposure, stimulus fading of the amount of food, differential reinforcement and escape extinction. The use of these strategies has been supported in studies of interventions for food selectivity in children with ASD (e.g. Ahearn, 2002; Levin & Carr, 2001; Paul et al., 2007). The results of the present study lend further support to the effectiveness of these strategies. In addition, the results also indicated that parents were able to combine research-supported techniques to deliver multi-component treatment packages in their homes.

The interventions also made use of several antecedent strategies. These included stimulus fading of the amount of food, visual schedules and behaviour shaping. While some of these strategies have not yet been thoroughly researched they were included in the treatment packages in an attempt to reduce the need for intense escape extinction procedures. Sharp and Jaquess (2009) posited that

antecedent strategies may reduce the aversive qualities of nonpreferred foods and so promote food acceptance and reduce disruptive behaviours. This inevitably reduces the likelihood that children will refuse to try the food and so may help avoid the use of strategies such as nonremoval of the spoon and physical guidance. The present study lends some support to this hypothesis, as improvements were gained in the food consumption of each of the children in the absence of these intense escape extinction strategies.

Interestingly, most of the parents who were taught to use behaviour shaping nominated it as the strategy they found to be the most useful. Perhaps the popularity of this technique is due to the way it shapes the behaviour of both the children and their parents. It is possible that parents of children with food selectivity typically have histories of aversive interactions with their children during mealtimes. This history may teach them to avoid their children's disruptive behaviours by only serving them foods they like. Behaviour shaping may break this cycle by increasing the likelihood that parents will actually carry out the intervention. That is, parents may perceive their children to be less likely to engage in disruptive behaviours and so will be more likely to challenge their food selectivity. Further, as the children are more likely to comply with smaller steps, they are also more likely to come into contact with reinforcement contingencies. This may mean parents are not required to implement escape extinction procedures as often and so avoid triggering the associated aggression, emotional distress and extinction bursts which this can produce. This process is likely to be reinforcing for both the parents and their children and so compete with avoidance behaviours learned through their shared history of aversive mealtimes. While the results of this study lend some promising support for the use of behaviour shaping and other antecedent techniques in parent-implemented interventions for food selectivity, more research is warranted.

Parent Implemented Interventions

It was originally intended that videos would be collected in order to evaluate the treatment fidelity of each parent. However, due to equipment failure and difficulty arranging observation times following the earthquakes (see the 'Challenges During the Study' section), not enough videos were collected to do this. However, using the videos that were available, it appears that as a group the parents demonstrated adequate treatment integrity (85.9%). They appeared to show excellent (100%)

proficiency in using positive reinforcement techniques (i.e. the token economy system and social reinforcement) and escape extinction techniques (i.e. representation and nonremoval of the meal). They also showed excellent (100%) proficiency in using strategies such as repeated taste exposure and verbal prompting. However, they only showed moderate proficiency (75%) in the use of visual schedules and in presenting the children with preferred activity choices. Their use of strategies such as pointing prompts (37.5%), partial physical prompts (0%) and the de-escalation procedure (50%) was poor. Only Thomas's parents demonstrated perfect use of the acceptance criteria. The other parents tended to move their children onto the next phase during behaviour shaping or stimulus fading of the amount of food before they had reached the appropriate acceptance criteria. These results indicate that parents of children with ASD are able to use behavioural strategies such as positive reinforcement and escape extinction effectively. However, they appear to have more difficulty with the antecedent strategies. Nonetheless, they were all able to bring about some improvement in their child's food selectivity without changes having first been implemented by a trained therapist.

It has been argued that parents may find strategies such as escape extinction particularly difficult to implement (Hoch et al., 1994). However, given that each child's food refusal was motivated by escape from nonpreferred foods, escape extinction was a crucial component of all the interventions in this study. Nonetheless, the escape extinction strategies used did not represent 'true' escape extinction as they included a termination criterion on which parents could terminate the intervention, similar to that used by Binnendyk & Lucyshyn (2009). It is possible that the termination criterion in fact helped parents to use the escape extinction procedure more accurately, as they may have been more likely to persist using the strategies than if they believed that they might have to go on indefinitely. However, it is also possible that gains may have been made more quickly if escape extinction had been fully implemented.

Teaching the parents to implement interventions themselves may have promoted generalization. Parents of four of the five children were able to introduce foods that were not targeted during the intervention, while parents of two children were also able to introduce food supplements. This suggests that they were able to generalize the strategies they had learned even in the absence of any support from the investigator. This is important, as for an intervention to be truly effective

parents must be able to use what they have learned to continue introducing new foods and promote the maintenance of mastered foods. All of the parents in the study indicated that they believed the interventions were effective and that they would continue to use the strategies they had learned.

It may be particularly important for the parents of children with ASD to have the skills to maintain foods that have been introduced. If the food selectivity in this population is caused by characteristics associated with ASD (such as restricted interests and repetitive behaviours) there may be an ongoing tendency toward selectivity that constantly competes with intervention strategies. It is possible that this was the case for William and Christina, as both these children were observed to return to displaying obsessive behaviours at follow-up. For example, Christina went back to picking pieces of pastry off of the mince pie and appeared to want to avoid the mince while William returned to picking pieces of skin off his orange before he would eat it. However, given that the parents of both children were trained in strategies to encourage consumption of nonpreferred foods it is possible that they will be able to ensure that these foods are maintained. Some support for the claim comes from the fact that both children retained some preference for these foods at follow-up. However, a longer follow-up would provide a more accurate indication of the long-term maintenance of nonpreferred foods in these children.

Food Preferences

The present study included preference assessments throughout each phase of the intervention in order to track any changes to the children's preferences for the targeted nonpreferred foods. All of the children showed an improvement in their consumption of targeted foods during the preference assessments except for Jordan. However, Jordan did show a slight increase in his consumption of orange in the first intervention preference session before it was eliminated from the study. These results suggest that the interventions may have actually increased the children's preference for the foods. This effect was the clearest for Taylor. His parents reported that the first targeted nonpreferred food to be introduced during his intervention had become one of his favourite foods. Two of the children (Thomas and William) even showed an improvement in their preference for foods that had not yet been specifically targeted during the intervention. It is possible that this effect could be due to

frequent exposure to the foods. It is also possible that as the intervention went on they become more confident in trying new foods.

It is important that children learn to like the foods that are introduced to them. The ultimate aim of these interventions was not only to bring about an improvement in the children's eating behaviours in the short term, but to increase functional food consumption in natural contexts in the long-term. This cannot occur if it continues to be necessary for parents to implement behavioural strategies each time they want their child to eat a particular food. Therefore, in order for an intervention to be considered effective, the child's preference for that food must increase enough so that the strategies may be faded out and the child can eat the food independently.

Challenges During the Study

The greatest challenge during this study has been the occurrence of multiple earthquakes throughout the intervention process. During September of 2010 a large earthquake struck the city, causing significant damage to its infrastructure. At present there have been over 10,000 earthquakes in the region, one of which caused considerable loss of life and injury. The families who participated in this study have been under immense stress. The children have endured major disruptions to their daily routines, periods of intense anxiety, damage to their property and increased parental stress. As earthquakes occurred throughout the intervention process it is very difficult to identify the exact effect this has had on the children's behaviour. However, some of the parents reported an increase in their children's problem behaviours. This is likely to have made it more difficult to implement the intervention. Further, the parents themselves have been under a great deal of stress, which may have affected their ability to implement the strategies consistently.

The earthquakes have also greatly affected the interpretability of the family quality of life measure. It is probable that any changes to parents' FQOL scores that were caused by the intervention have been masked by the effects of the earthquakes. The total scores of four of the eight parents who participated in the study actually decreased between baseline and post-intervention. Total scores increased a little for three of the other parents and remained the same for one. Given the chaotic nature of the past 18 months, it is impossible to determine if any of these changes may be attributable to the effects of the intervention.

Another complication during the study has been the occurrence of several stressful events in the lives of some of the families. These have included job losses, parental separation and the death of relatives. It is possible that events such as these also affected the children's behaviour, the parents' ability to commit to implementing the interventions consistently and the outcome of the FQOL surveys. However, stressful life events are not uncommon in the real world, and so practitioners must be able to teach parents strategies that they can use even in times of stress. The present study lends some support to the usefulness of behavioural strategies in such circumstances, as the parents were all able to bring about an improvement in their children's food selectivity, even in the face of great geological adversity.

Limitations

A major limitation of this study is the lack of individual parent treatment fidelity data. While parent treatment fidelity data has been presented for the group of parents as a whole, not enough parent intervention sessions were videotaped in order to get an accurate measure of the proficiency of individual parents in using the intervention strategies. This data would have been highly valuable, as it would have allowed a more in-depth examination of the ability of parents to carry out the interventions in their homes. It may also have allowed an analysis of the relationship between parent treatment fidelity and the effects of the intervention.

Another limitation is the lack of pre-intervention psychometric assessment. The children in this study were included based on their parents' assertion that they were food selective. While the limited number of foods in their dietary repertoires corroborates this, it would have been interesting to have used a psychometric measure of food selectivity, such as the Brief Autism Mealtime Behavior Inventory (BAMBI; Lukens & Linscheid, 2008). This would have allowed an examination of any changes to the scores between pre and post-intervention. It may also have been useful to take measures of the children's communication ability or adaptive functioning. This would have allowed a more in-depth discussion of which child characteristics might affect the outcome of the intervention. For example, it is possible that children with more advanced receptive language skills coped better with the intervention than children who had poorer receptive language skills. It is not possible to

speculate on this without taking formal measures of these variables. This information could have been useful in guiding the design of future interventions.

A third limitation is the lack of pre-intervention data of food acceptance and disruptive behaviours during family mealtimes. While it was important to make the intervention process as simple as possible for parents, it would have been useful to get a measure of the strategies they used before the intervention and the disruptive behaviours their children engaged in. This would have been particularly helpful in Christina's case. Christina engaged in very few disruptive behaviours throughout the intervention process, yet her parents reported that before the intervention she engaged in disruptive behaviours whenever they tried to present her with nonpreferred foods. If data had been collected that showed this, it might have been possible to make a comparison between pre and post-intervention disruptive behaviours and speculate about the acceptability of the intervention to the children.

Another variable which was not measured during this study was the amount of time the investigator spent training parents. While the number of sessions that were attended by the investigator was recorded, much of this time was spent collecting data rather than training parents. It would have been highly valuable to gain some measure of how much training each of the parents received. This information could have been used to form a cost-benefit analysis that would allow practitioners to estimate how much of their time might be required in order to assist families of children with ASD and food selectivity to implement successful interventions at home.

Another limitation of the present study is the lack of collaboration with other professionals. The advice of an Occupational Therapist may have been warranted in the case of Taylor, who appeared to show some aversion to objects being put in his mouth (such as a spoon or toothbrush). Similarly, it would have been useful to have involved Christina's dietician before the beginning of the intervention so that her recommendations could have guided which foods were targeted for intervention. O'Brien et al. (1991) recommended an interdisciplinary approach to assessing feeding problems in children. They stated that this would help to determine whether children's feeding problems were related to organic causes, determine their current nutritional status, uncover any oral motor difficulties and identify the parent or child behaviours that contributed to mealtime problems.

A final limitation is that measures were not taken of the other goals parents had during the interventions. Several of the parents not only wanted to increase the number of foods in their children's dietary repertoire, but also formulated additional goals to address other mealtime problems. For example, Taylor's parents came up with the additional goal of encouraging him to eat food off a fork. While it was observed that Taylor appeared to use the fork more often toward the end of the intervention, no data is available to corroborate this. While it was not within the scope of the current study to collect data on these additional goals, it would have been interesting to measure the ways in which parents applied the strategies they learned to other mealtime problems and how their children responded to this.

Future Research

While research into effective interventions for food selectivity in children with ASD is beginning to accumulate, there are still many avenues of this area that remain unexplored. As described in the section above, some of these avenues include comparing the effectiveness of interventions with children of different levels of adaptive functioning and different communication abilities, investigating the amount of parent training required to achieve adequate treatment gains, comparing interventions that involve a multi-disciplinary team with those that do not, and investigating the effects of parent training on goals other than increasing food consumption. However, many other areas of interest also exist.

A particularly interesting area of research would be to compare the effects of introducing food items one at a time (as was done in the present study) with the effects of targeting several food items at once. While Ahearn (2002) conducted a preliminary study investigating this very issue, the intervention was carried out by trained therapists. It would be interesting to replicate the study with parents as the treatment implementers. It is possible that teaching parents to introduce multiple food items at once may facilitate them to use the strategies they learned to target more foods in the absence of professional support and to maintain previously introduced foods. Alternatively, parents may find the intervention harder to maintain if children do not make the rapid gains seen when only one food item is targeted. These issues have great implications for the way in which practitioners train parents, and so should be thoroughly researched.

Currently, there are few of studies investigating the effects of antecedent strategies in the amelioration of food selectivity in children with ASD. Given the potential of these techniques to reduce the need for harsh escape extinction procedures, this neglect is surprising. The present study made use of several antecedent strategies, such as stimulus fading of the amount of food, visual schedules and behaviour shaping. Behaviour shaping was perceived by the parents to be particularly useful. The parents of Taylor actually generalized the use of the strategy to teach him other skills, such as brushing his teeth. The effects of behaviour shaping strategies in interventions for food selectivity need to be investigated more thoroughly. Further, it would be interesting to examine whether other parents are also able to generalize the skill to different areas of their children's lives.

There are a variety of effective behavioural strategies available to address food selectivity which have been well supported by the literature. The present study demonstrated the effectiveness of several of these strategies in combination with some antecedent strategies which have yet to be thoroughly researched. The strategies were implemented effectively by parents of children with ASD to produce an improvement in their consumption of nonpreferred foods. Further, the interventions also appeared to increase the children's preference for these foods. The results of this study contribute to the emerging literature on effective strategies for ameliorating food selectivity in children with ASD. However, it still remains unclear which of these strategies are actually used in practice. It would be of great value to conduct an investigation into which techniques are currently used in New Zealand feeding clinics for children with ASD. This information could be used to guide research into areas that are most relevant to practitioners. It is also possible that this may highlight the need for greater dissemination of research on the treatment of food selectivity in children with ASD.

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CHRISTCHURCH NEW ZEALAND

APPENDIX I

Information Sheet

Evaluation of a Parent Implemented Intervention for Food Selectivity in Children with Autism.

I am a Masters student studying Child and Family Psychology at the College of Science, University of Canterbury. I am currently looking at ways to help parents of children with Autism Spectrum Disorder (ASD) to increase the range of foods in their children's diets. Previous research has shown that children with ASD can learn to like and to eat foods that they presently refuse if parents work with one new food at a time, take small steps, and reward them when they accept the food.

I would like you and your child to participate in this study. If you choose to participate, I will meet with you to discuss your child's food selectivity and to help you to define what your goals will be. We will assess the reasons why your child avoids certain foods and what foods he/she prefers. Based on this, we will come up with an intervention specific to the needs and strengths of your child. I will support you as you implement this intervention in your home.

We will record the number of bites your child takes of the foods we are introducing and any problem behaviours he/she engages in at each meal. We may also measure things that are related to the goals that you have outlined prior to the intervention (e.g. the length of time it takes to complete a meal). I will ask you to participate in two short questionnaires, which will measure how effective you believe the intervention is, how much you feel the intervention positively affects your family, and how well you feel the intervention fits with your family.

I estimate that this intervention will run for between 4 and 8 weeks. The actual length of the intervention will be based on your child's progress and your preference. If at any stage during the intervention you no longer wish to participate or for your child to participate you may withdraw from the study. Any data I have collected will then also be withdrawn.

My final thesis will be a public document that can be accessed through the University of Canterbury library database. If you choose to participate you will be offered a copy of the summary of findings. All data collected for this study will be treated as confidential and no information which could be used to identify you or your child will be published.

This study has been reviewed and approved by the University of Canterbury Human Ethics Committee. If you have any questions about this study you may contact me or my supervisors. If you have any complaints you may also contact the Chair of the University of Canterbury Human Ethics Committee (see contact details below).

Thank you for your time,

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APPENDIX II

Letter of Ethical Approval

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

HUMAN ETHICS COMMITEE

Secretary, Lynda Griffioen
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2010/63

30 June 2010

Emma McKenzie
Department of Psychology
UNIVERSITY OF CANTERBURY

Dear Emma

The Human Ethics Committee advises that your research proposal "Evaluation of a parent implemented intervention for food selectivity in children with Autism" has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 29 June 2010.

Best wishes for your project.

Yours sincerely

Dr Michael Grimshaw
Chair, Human Ethics Committee

APPENDIX III

Preference Assessment Data Sheets

Child's Initials: Reporter's Initials: Intervention Phase: Date:

Trial/Food	Protest	Expel /Gag	Throw food	Hit/ Push	Leave table	Other	Consumption (√ / X)	Consequence	Time
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									
11.									
12.									
13.									
14.									
15.									
16.									
17.									
18.									
19.									
20									

V = Verbal Praise T = Token R = Reward I = Ignore Re = Redirect

APPENDIX IV

Intervention Data Sheet

Child's Initials: Intervention Phase:
Parent's Initials: Date:

Trial/Food	Protest	Expel /Gag	Throw /push food	Hit/ Push	Leave table	Other	Consumption (√ / X)	Consequence	Time
1.									
2.									
3.									
4.									
5.									

Parents Initials: Date:

Trial/Food	Protest	Expel /Gag	Throw/ push food	Hit/ Push	Leave table	Other	Consumption (√/X)	Consequence	Time
1.									
2.									
3.									
4.									
5.									

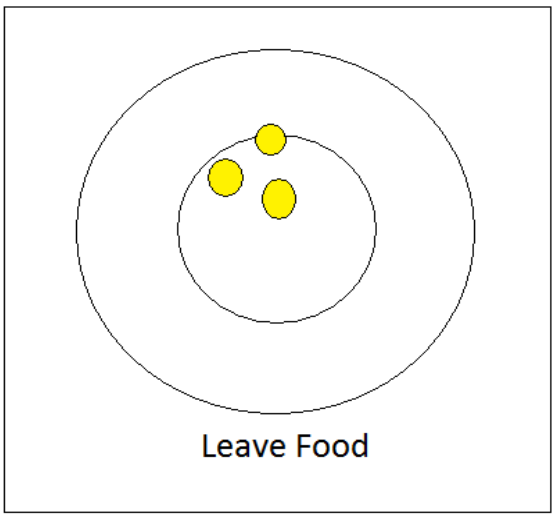
Parents Initials: Date:

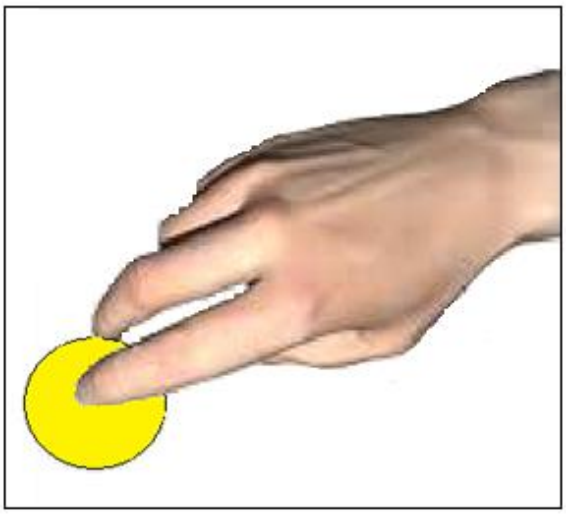
Trial/Food	Protest	Expel /Gag	Throw/ push food	Hit/ Push	Leave table	Other	Consumption (√/X)	Consequence	Time
1.									
2.									
3.									
4.									
5.									

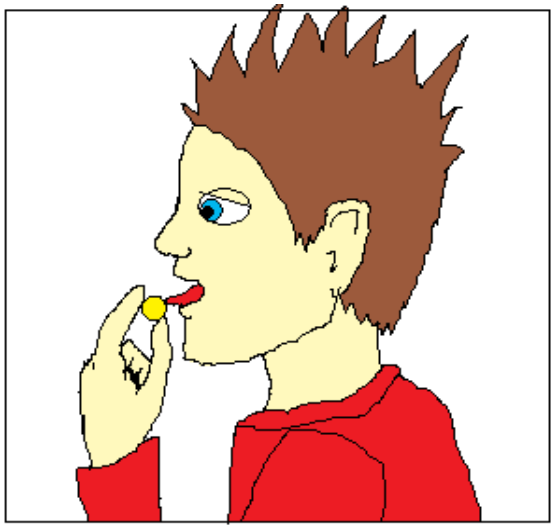
V = Verbal Praise T = Token R = Reward I = Ignore Re = Redirect

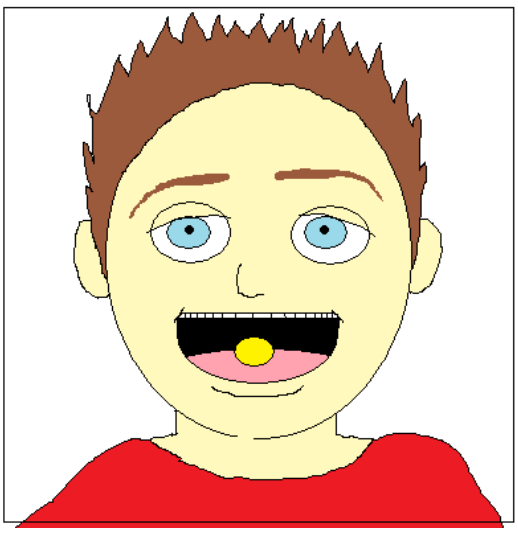
APPENDIX V

Images of Target Eating Behaviours









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