

ABSTRACT

Interventions for Feeding Disorders in Autistic Children: Behavioral Therapy vs. Sensory
Integration

Isabelle Lin

Director: Kristle Soto, M.S., CCC-SLP

Sensory Integration Therapy (SIT) is a common method of treatment for feeding disorders in children with autism spectrum disorders (ASD). However, it has received less recognition than behavioral therapies because it is more difficult to quantify the effects of SIT in an experimental setting. Through a review of current literature this thesis project explores the effectiveness of SIT in conjunction with behavioral interventions for the treatment of feeding disorders in pediatric ASD populations. This review evaluated ten studies that used SIT, behavioral therapy, or a combination of interventions to treat disordered feeding. The results suggest that SIT yielded positive results. However, it is difficult to gauge the effectiveness of these methods outside small population sizes due to the highly individualized feeding therapy plans that each client requires. Despite limited findings on the effectiveness of these methods, a survey of clinicians showed that most professionals use SIT to treat feeding disorders.

APPROVED BY DIRECTOR OF HONORS THESIS

Kristle Soto, Department of Communication Sciences and
Disorders

APPROVED BY THE HONORS PROGRAM

Dr. Elizabeth Corey, Director

DATE: _____

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Integration

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By
Isabelle Lin

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DEDICATION

To my parents, who have taught me to value education.

To Professor Soto, who has given me confidence in pursuing my goals.

To my brother, who is my joy and my best friend.

CHAPTER ONE

Literature Review

This thesis project will explore the effectiveness of Sensory Integration Therapy (SIT) as observed in conjunction with behavioral interventions for the treatment of feeding disorders in children with autism spectrum disorders.

Autism spectrum disorder (ASD) refers to a group of neurodevelopmental disorders affecting up to one in forty-two children. ASD is characterized by repetitive and restrictive patterns of behavior, as well as difficulties with social communication and interaction. The symptoms are present from early childhood and affect daily functioning. An estimated forty-six to eighty-nine percent of children with ASD exhibit feeding problems that commonly fall into three categories: food refusal, food selectivity based on type and texture, and disruptive mealtime behaviors. Feeding problems result in diminished nutritional quality, parental stress, and adverse impact on family functioning.

Feeding difficulties are often divided into two categories: food selectivity and food sensitivity. Food selectivity refers to a child's behavioral response to food. Typically derived from a negative history with food such as vomiting due to a hypersensitive gag reflex or infant allergies, food selectivity is the most frequently reported feeding concern among caregivers of children with ASD. It is associated with poor nutrition such as hypocalcemia (low levels of calcium in the blood), low protein intake, water-soluble vitamin deficiencies, and high caregiver stress. Each child who experiences food selectivity presents differently due to variances in ASD, individuals, cultures and caregiver practices. Food sensitivities are related to sensory processing deficits, which are

common among individuals with ASD. Food sensitivity can present in several different ways. For example, children with tactile hypersensitivity (heightened sensitivity to touch) might be unable to tolerate having food on their skin or mouth, and children with tactile hyposensitivity (lack of sensitivity to touch) might be unable to discriminate the food on their skin or mouth. Feeding difficulties in children with ASD do not naturally resolve with age; qualified professionals need to address food sensitivity and food selectivity, as they may lead to malnourishment and hinder development.

Interventions that have proven most effective are escape extinction and noncontingent reinforcement. Reinforcement consists of either giving something (positive reinforcement) or taking something away (negative reinforcement) following the occurrence of a behavior that increases the chance that the behavior will increase in frequency. A clinician may use reinforcement that is contingent, or dependent, on the desired behavior being successfully completed; or a clinician can use noncontingent reinforcement (NCR), meaning the reinforcement is used whether or not the desired behavior is carried out. Extinction is when a previously reinforced behavior no longer receives reinforcement (positive or negative). Thus, escape extinction (EE) means not allowing escape from an aversive condition contingent upon problem behavior (including non-compliance). Addison et al. (2012) concluded in “A comparison of sensory integrative and behavioral therapies as treatment for pediatric feeding disorders” that combining EE and NCR is effective in increasing acceptance, decreasing inappropriate behaviors (such as throwing food, shouting, crying, spitting out food), and increasing the amounts of foods consumed. These interventions rely on the principles of cognitive-behavioral therapy.

Fading is another commonly used intervention in feeding therapy. Fading refers to decreasing the level of assistance needed to complete a task or activity over time. The clinician gradually assists less with feeding, allowing the child or caregiver to take over. Consistent with applied behavioral analysis (ABA), fading has been effective in increasing children's food variety and consumption, as well as coaching parents to continue feeding therapies at home.

Sensory integration therapy (SIT) has also been successful. Sensory integration refers to the processing, integration, and organization of sensory information from the body and the environment; it plays an important role in all the things that we need to do on a daily basis, such as getting dressed, eating, moving around, socializing, learning and working. SIT involves structured exposure to sensory input, movement therapy, balance treatments, and carefully designed and customized physical activities. This methodology is not exclusive to feeding therapy, but it can be applied to feeding therapy in many ways. For example, a child might be encouraged to play a physically active game before mealtimes, play with a new food before they are prompted to eat it, or wear a weighted blanket or vest while eating. Each child has different sensory needs and meeting these needs can improve experiences and behaviors around mealtimes. SIT has been especially effective when paired with EE and NCR. However, it is more difficult to quantify the effects of SIT, as it is a dynamic therapy. Dynamic therapy, as well as dynamic assessment, is highly interactive and process-oriented, with a focus on identifying the skills an individual possesses as well as their learning potential. This method is flexible and relies less on standardized procedures. Results vary according to the individual child and the severity of sensory feeding concerns.

One of the main sensory-based interventions used in feeding therapy is food chaining. Food chaining involves presenting the child with new foods that are similar in taste, temperature, or texture to foods the child already likes and accepts. For example, if a child likes dinosaur-shaped chicken nuggets a clinician might present them with chicken nuggets of a different brand, followed by differently shaped nuggets, then move on to another breaded food item like fried zucchini, and finally to un-breaded zucchini. In this way, the child is gradually introduced to a new food in a comfortable way and will be willing to continue eating this new food. There are different types of food chaining, including flavor mapping, transition foods, and flavor masking. Flavor mapping involves analyzing the child's favorite foods for patterns (similar flavor, texture, color). The use of transitional foods entails presenting bites of favorite foods in between bites of new food. Flavor masking involves finding flavors accepted by the child that can be used on a variety of newer food items. For example, ranch dressing, cheese, and cinnamon can be added to new foods to make them more appealing to the child. Masks are designed to be phased out as the child tolerates the targeted food items.

CHAPTER TWO

Methods

Many of the measures used to assess feeding problems are not specifically intended for children with ASD. This poses a challenge because often problems are unique to this population and measures do not address the specific difficulties present, including sensory feeding problems. The Brief Autism Mealtime Behavior Inventory (BAMBI) was developed explicitly to measure mealtime and feeding behaviors in children with ASD. The BAMBI consists of eighteen items and looks at three factors: Limited Variety, Food Refusal, and Features of Autism. “Limited Variety” looks at the child’s willingness to try new foods, as well as how they respond to foods categorized by preparation, texture, and type (fruits and vegetables, meat, etc.) This section consists of eight items (questions and or tasks). The “Food Refusal” portion consists of five items that note the problem behaviors observed during mealtimes: crying, vomiting, expulsion (spitting out food), shouting, throwing food and utensils. Finally, “Features of Autism” reflects the behavioral characteristics of ASD, such as repetitive behaviors, self-injurious behaviors, inattention, and restrictive behaviors. The BAMBI was used to determine eligibility for some, but not all, of the studies referenced in this review of current literature.

Another tool used in the clinical assessment of feeding problems is the Sensory Profile (Dunn, 1999). The Sensory Profile is a 125-item caregiver questionnaire frequently used in clinical practice to identify sensory processing challenges in children with ASD. Similar to the BAMBI, it uses a 5-point Likert scale (always, frequently,

occasionally, seldom, never) to record caregivers' observations of their child's feeding habits. Questions are scored along nine factors of sensory processing difficulties including Sensory Seeking, Emotionally Reactive, Low Endurance/Tone, Oral Sensory Sensitivity, Inattention/Distractibility, Poor Registration, Sensory Sensitivity, Sedentary, Fine Motor/Perceptual. Children scoring within the 84th percentile of the reference sample (which is comprised of 1200 typically developing children), are classified as "Typical", meaning they have typical sensory processing ability for each factor. Children who score above the 85th percentile are classified as "Atypical", which indicates sensory processing difficulty for one or more factors. Within the Atypical category, participants are further classified as having "probable" sensory processing issues or a "definite" sensory processing disorder.

The EAT-UP (Easing Anxiety Together with Understanding and Perseverance) feeding therapy program utilized the sensory integration methods of changing the size of bites, changing the eating environment, and food chaining. This program places focus on training caregivers to implement ninety percent of the interventions at home. Cosby and Muldoon (2016) studied the effectiveness of this program with a focus on parent-implemented interventions (PII) and a combination of sensory-based and behavior-based interventions.

The children were systematically desensitized to the less preferred food through the use of the visual hierarchy and reinforcement for successive approximations. They learned the steps of the hierarchy, were able to explore the foods in a non-threatening way through touching and tasting it, and had visual representations of their parent's expectation to minimize any anxiety related to unclear expectations. (Cosbey & Muldoon, 2016)

The EAT-UP program demonstrated that sensory integration is effective when paired with other interventions, particularly caregiver involvement and family-centered

intervention. Cosbey and Muldoon studied three boys, aged six, seven, and eight years old. To be eligible for the study, families had to live thirty minutes or less from the clinic, at least one parent had to be proficient in English, the child had to have received a multidisciplinary diagnosis of ASD between two and nine years old, and the participants had no medical contraindications for oral feeding. Each of the three boys had received a diagnosis of ASD prior to their third birthday and was assessed to have significant behavioral difficulties around mealtimes, assessed using the BAMBI.

Researchers began by establishing a baseline, collecting data on each child's food consumption and mealtime behaviors prior to treatment, and identifying intervention goals. An individualized intervention plan was devised for each family, including a food acceptance hierarchy specific to the child. Next came the intervention-coaching phase, in which a researcher coached one caregiver per child to implement the intervention plan during mealtimes. Strategies used in the program were divided into four categories: food characteristics, dyadic communication, physical environment, and social environment. "Food characteristics" involves attention to the child's food preferences based on textures, shapes, colors, etc. For example, the caregiver presents both preferred and less preferred foods during the meal. Dyadic communication refers to communication between the parent and child with guidance from a clinician. This category includes promoting appropriate communication of ideas like "I don't want that" and using a picture menu or verbal choices for the child to select foods. The physical environment category consisted of eating meals at a specific table, staying at the table with the child, and increased expectations for time spent at the table. Some social environment strategies were maintaining a positive tone and using siblings as peer models. Once the parent

independently implemented at least ninety percent of the intervention strategies each session, for three consecutive sessions, the intervention-independent phase began. No support was provided to the parent during the session. The researcher observed the meal and collected data regarding the child's food acceptance and the parent's execution of mealtime strategies, then provided written and verbal feedback at the end of the session. The EAT-UP program concluded when the child met a food acceptance score greater than eighty-five percent, based on their individualized food acceptance score.

“Effects of repeated food exposure on increasing vegetable consumption in preschool children with autism spectrum disorder”, conducted by Kim et al. (2018), investigated the effect of a preventative program for children at high risk of feeding concerns. It utilized sensory exposure to measure the effects on the consumption of vegetables among preschool-aged children with ASD. Twenty-seven boys with ASD between ages two and five and a half years were recruited through five ABA early intervention agencies. Parents of the participants reported their child had moderate food selectivity. Participants were randomly sorted into either a six-month-long exposure program or a control group. The exposure program consisted of three stages, in which participants had repeated visual and tactile contact with twelve different vegetables considered critical for development, which were further selected for accessibility and availability. Tactile and visual exposure increased throughout the program. Stage 1 included activities such as shaking vegetables in a transparent bottle, looking at vegetables through transparent colored lenses, and putting vegetables into a cardboard character's mouth. Stage 2 included more tactile interaction including threading vegetables together to make a necklace, cutting vegetables into pieces and putting them

together like a puzzle, and decorating vegetables with stickers. Finally, Stage 3 involved the most contact between the children and vegetables, with participants building towers out of vegetables and mashing vegetables with their hands. The control group received their usual treatment at each agency, then completed pre- and post-assessments at the same times as the exposure group. At the end of six months, the vegetable consumption and overall nutritional intake of both groups were studied, both in the experimental setting and during regular mealtimes. Vegetable consumption was greater in the exposure group. No significant group differences were found in overall nutritional intake.

Paul et al. (2018) observed the effect of taste exposure and EE in the treatment of food selectivity in “Combining repeated taste exposure and escape prevention: An intervention for the treatment of extreme food selectivity.” The study followed the treatment of two children with ASD: five-year-old Kim and three-and-a-half-year-old Jim. Both children had ASD and were referred to a pediatric feeding center for severe food selectivity. Neither child was receiving medications or treatment for comorbid chronic illnesses at the time of the study.

At the start of the project, caregivers of the two participants were asked to identify foods eaten by their families from a list of common foods. Selected items were presented in treatment. The program began with taste sessions, in which the children were presented with a single pea-sized bite of food and told “When you take your bite, you can go play.” A small initial bite size was chosen to minimize response effort and increase acceptance. Inappropriate behaviors such as crying, throwing utensils, spitting out food, etc. were ignored. If the child spat out the bite, a new bite of the same food was presented. After the bite was eaten, a timer was used to indicate the start of the next taste

session, a minimum of five minutes after the bite was eaten. When a child ate a bite of a particular food within thirty seconds for three out of four taste sessions, the bite size was increased for that food. The size progression was as follows: pea-sized, half-spoonful, full spoonful. Once the child accepted full spoonfuls of a food, the food was reintroduced in later probe meals to evaluate the effects of repeated taste exposure.

Probe meals involved presenting each participant with three tablespoons each of three to four foods on a plate. The children were provided with regular utensils and a drink in a small cup. All foods were selected from the newly introduced foods in the previous sessions; they were not part of the children's pre-treatment diet. The probe meals lasted ten minutes, their end signaled by a timer, and bites were presented to the child with no other prompts. The child was not required to eat all the food, inappropriate behaviors were ignored, and any bites of food taken were rewarded with praise of the child. If the child did not taste one or more of the foods in the probe meal, they received a five-minute break followed by taste sessions.

Next, the children participated in generalization meals outside the clinical setting. Generalization is when an individual applies something learned in a specific situation to other similar situations, progressing toward therapy objectives. The goal of these meals was for the children to apply the eating habits learned in the clinic to the families' meals at home. Caregivers were given foods or a list of foods presented during probe meals and taste sessions and asked to offer them to the children at home. Generalization meals followed the same format as probe meals: children were not required to eat any of the foods offered, parents recorded the number of bites taken and the variety of foods eaten, and inappropriate behaviors were ignored (but still recorded). Overall, treatment was

conducted for thirteen days for Kim and fifteen days for Jim. Prior to treatment, Jim consistently ate two foods. Kim relied completely on a gastrostomy tube for nutrients. At the conclusion of the intensive treatment program, Jim met the criteria for success with sixty-five foods. Kim also had great improvement, with forty-nine foods and no dependence on a gastrostomy tube.

“Sensory sensitivity and food selectivity in children with autism spectrum disorder,” conducted by Chistol et al. (2018), evaluated the relationship between oral sensory processing and food selectivity in children with ASD. It also assessed differences in oral sensory processing in typically developing children compared to children with ASD. This study used data from the Children's Activity and Meal Patterns Study (CHAMPS). Fifty-three children with ASD and fifty-eight typically developing children ages three to eleven years participated in the study. Participants were excluded if they had been diagnosed with a medical condition that affects dietary or physical activity habits, or if they were taking medications known to have an impact on appetite. Diagnoses of ASD were confirmed using the Autism Diagnostic Interview-Revised (ADI-R). Caregivers completed a demographic/medical questionnaire, a Food Frequency Questionnaire (FFQ), a three-day food record, and the Sensory Profile. Chistol et al. found that atypical oral sensory processing is greater in children with ASD and is associated with higher levels of food selectivity as well as decreased fruit and vegetable variety.

Reinoso et al. (2018) conducted a systematic review of literature looking at Sequential Oral Sensory (SOS), Sensory Integration (SI), and Differential Reinforcement of Alternative Behavior (DRA) in order to assess their effectiveness as interventions for food selectivity and sensitivity in children with ASD. SOS is a play-based approach to

feeding under the umbrella of Sensory Therapies and Research (STAR). The occupational therapist first evaluates the child's diet to identify food sensitivity, selectivity, or a combination of both. The intervention then consists of composing and progressing through a food hierarchy, gradually exposing the child to new foods and beverages with different tastes, textures, colors, etc. The SOS-trained therapist incorporates a variety of foods into positive social activities and games to reinforce acceptance of new foods while respecting the child's readiness to progress through their food hierarchy. If, for example, a child avoids foods with strong smells, they may first be introduced to foods that are less aromatic such as lettuce and white rice. Whereas, if the child displays behavioral avoidance to foods, the therapist may utilize a treatment session to introduce a child to a new food like yogurt. As the child plays with the yogurt, the therapist will encourage them through positive social interaction. Four factors are measured in the SOS approach: self-motivated feeding, enjoyment when feeding, adequate caloric consumption, and improved family functioning during meals. DRA is an applied behavioral analysis technique that involves reinforcing a preferable behavior as an alternative to an unwanted behavior. For example, a child who screams or throws food will be ignored; only when they communicate in an appropriate manner will the caregiver or clinician acknowledge the child and satisfy their request. Reinoso et al. concluded that the techniques used in this review are effective for food selectivity; the authors identified a need for further research regarding food sensitivity.

Lang et al. (2012) systematically identified and analyzed intervention studies involving the use of sensory integration therapy in "Sensory integration therapy for autism spectrum disorders: A systematic review". Their research showed that SIT has

limited evidence-based practice approval because it is difficult to empirically prove effectiveness. However, they also found that eighty-two percent of occupational therapists report using sensory integration methods in the treatment of feeding disorders. This is most likely due to clinicians seeing positive results in individuals during treatment when using sensory-based interventions in their personal practice. It is difficult to produce empirical data proving that these methods are effective, but therapists see compelling results in their own clinics and continue to implement sensory integration methods regardless of the lack of published research supporting their use.

Given the lack of scientific evidence, it would seem alarming how often SIT is reported delivered to individuals with ASD (Case-Smith & Miller, 1999; Green et al., 2006; Watling et al., 1999) by agencies that are mandated to use evidence-based interventions. For example, The Individuals with Disabilities Education Improvement Act (IDEIA, 2004) and No Child Left Behind Act (NCLB, 2001) require that schools implement evidenced-based interventions. Therefore, outside of a research context with approvals from relevant ethics committees and informed consent, our review suggests that SIT should not be commonly implemented within public schools that receive federal funding in the United States. However, eighty-two percent of the 292 OTs interviewed by Case-Smith and Miller reported they always use SIT with children with ASD and sixty-six percent of those OTs were employed by schools. Another eighteen percent implemented SIT with children with ASD in early intervention programs that may also receive federal funding or reimbursements from insurance companies. (Lang et al., 2012).

CHAPTER THREE

Results

Social validity refers to how well an intervention is received by those working with the child in real-life settings, such as caregivers, teachers, and therapists. This is key to successful implementation of a treatment program in a real-life setting. Regardless of a method's effectiveness in an experimental setting, it must also be applicable beyond the clinic. For example, taste exposure is a common practice in feeding therapy. However, unwanted taste exposure increases resistance to food in the child and creates a negative experience with eating, resulting in low social validity. Play activities, on the other hand, are less recognized as an effective practice in therapy but have high social validity. Incorporating play makes a program easier for therapists and caregivers to implement and results in the child having pleasurable experiences that they associate with eating. Many behavioral interventions commonly used in feeding therapy may yield greater results in the clinic but are not suited to practical use afterward in everyday life. Meanwhile, sensory interventions may be less well-documented as effective strategies in experimental settings but contribute significantly to improving feeding during regular mealtimes.

The effects of EE and taste exposure as preventative measures to reduce food selectivity are well-documented for typically developing children, but not for children with ASD. These methods often involve coercive feeding, which may associate foods with unpleasant feelings. This may even lead to increased food selectivity. These downsides may appear more severely in children with ASD, who are more resistant to

change and at a higher risk of developing problem behaviors compared to typically developing children.

Research on feeding problems in children with ASD disproportionately study male participants. This may be influenced by the fact that male children are more likely to be diagnosed with ASD, and more likely to be diagnosed earlier in life. Paul et al. (2018), Addison et al. (2012), Chistol et al. (2018), and Lang et al. (2012) included female participants but were still disproportionately comprised of male children. Studies that did include a larger proportion of females had very small sample sizes.

Another area requires more research is integration of parent implemented intervention (PII) with feeding interventions. PII is an evidence-based practice in which a parent learns to provide intervention in their home or community through a guided training program. Use of this practice with young children promotes sustainability of the behavior change across time and outcome areas (Cosbey & Muldoon, 2016). Few studies have utilized clinic-based training programs to explore the use of parents as interventionists.

A comprehensive synthesis of treatment outcomes in feeding interventions by Sharp et al. (2010) indicated that only 58.3% of the interventions documented caregiver training and over 80% of the studies had trained professionals, rather than parents, providing the intervention. (Cosbey & Muldoon, 2016)

Most research regarding improvement of mealtime behaviors involve a clinician working directly with the child. Caregiver intervention is key to treating feeding problems beyond a clinical setting. The level of caregiver effort, as well as whether there is a family component to the treatment program, can affect the results of a study.

SIT is hard to quantify for numerous reasons. It is more difficult to study because it is dynamic and looks different for every child. Most research regarding SIT is not

specific to feeding therapy. Further, children with ASD often require even more highly individualized intervention. Thus, there is a lack of research on the efficacy of sensory integration in the treatment of feeding problems in children with ASD. Reinoso et al. (2018) highlighted the fact that most research regarding sensory-based interventions has been conducted on small samples without a randomized control group.

Reinoso et al. discussed controversy regarding the efficacy of SOS for children with ASD. Their research cites several studies with promising results, as well as one study that reported negative results. The successful studies reported short and long-term changes in food repertoire, milestone acquisition, and adaptive behavior. The study yielding negative results may have confounded results due to the crossover design; this model was not conducive to the success of SOS, which has a far greater impact with longer duration of treatment. A crossover trial involves subjects receiving a sequence of different treatments for a short amount of time each. Because SOS's impact is exponentially greater with longer duration of treatment, this experimental setting contributed to less favorable results regarding these sensory-based methods.

Kim et al. (2018) concluded that less intrusive forms of exposure such as tactile and visual exposure could be sufficient to prevent severe feeding problems. Tactile and visual exposure minimize the child's resistance as well as the caregiver's effort and cost to resolve feeding problems. This study also showed the benefits of incorporating play activities into the treatment program. The therapists and assistants who carried out the program reported that the procedure was easy to follow and incorporate into their daily routine. Further, the children "participated with pleasurable expressions in every session, and little to no resistance throughout the 6-months training period was observed" (Kim et

al., 2018). Associating a playful mood with each feeding activity may have improved their preference for vegetables. This is consistent with classical conditioning, in which the children learned to associate enjoyment during play with the vegetables used in the activities. This demonstrates that play is an intervention with good social validity when treating feeding problems in children with ASD.

Because this program is preventative, its applications for targeting existing feeding problems in children with ASD are limited. Additionally, participants for this study were selected in groups via early intensive behavioral intervention (EIBI) agencies, so neither a diagnostic evaluation for ASD nor a direct assessment for food selectivity was conducted. Another limitation of this study is that it is group-based rather than individualized. One-on-one instruction is the most effective teaching strategy for children with ASD. This group-based prevention program is a novel and potentially cost-effective strategy to resolve feeding issues, but the same strategy does not work for every child, and their progress will not be the same when the same strategy is used.

In Cosbey and Muldoon's 2016 study regarding the EAT-UP feeding intervention program, all three participating families reported improvement in mealtime behaviors, increased acceptance of less preferred foods, and increased diversity of accepted foods. Caregivers also reported decreased stress around mealtimes for both the child and their family, contrasting with high levels of stress at the onset of the project. The social validity was evaluated twice during the study through caregiver surveys. At both points, the caregivers reported that the intervention strategy reflected their family's goals, strengths, and needs. They felt confident implementing the intervention plan as directed, and no adverse events involving any of the participants of the study were observed or

reported. Cosbey and Muldoon (2016) emphasized feeding therapy in the context of supporting families of children with ASD in the most natural setting possible. The natural setting, use of both sensory and behavioral strategies, and highly individualized intervention plans contributed to a sustainable feeding therapy program that families can continue to implement successfully in their daily lives. This study demonstrates the importance of a holistic and personalized approach to feeding therapy, in which the intervention plan supports the entire family as well as the child and involves strategies (both behavior- and sensory-based) that address their specific needs.

Paul et al. (2018) found that escape prevention, repeated taste exposure, and fading in feeding therapy increased the variety of foods eaten by the participants, two children with ASD and severe feeding problems. The treatment reduced inappropriate mealtime behaviors and proved effective at home, where parents conducted probe meals with the foods used in treatment. Though the researchers attributed success to behavior-based interventions, this study utilized other methods to improve participants' mealtime behaviors and food acceptance: parent-implemented interventions (PII) and play. As explained by Kim et al. (2018), taste exposure often involves coercive feeding, which can result in adverse experiences associated with eating and even lead to increased food selectivity. Paul et al. (2018) did not report any negative responses in participants in this regard. The small sample size, only two children, may account for this result.

CHAPTER FOUR

Discussion

This methodological review evaluated the effectiveness of SIT as observed in conjunction with behavioral interventions in the treatment of feeding disorders in children with ASD. Results reported by the studies suggest that sensory-based interventions yielded positive results in individual cases but the effectiveness of these methods in formal research with larger population sizes did not reflect the same benefits. This may be due to the highly individualized needs of each client in the implementation of feeding therapy.

One interesting finding through this review was that eighty-two percent of therapists reported using sensory integration methods despite the lack of empirical data supporting these methods. Clinicians likely continue using these interventions because they produce positive results, which are evident in the improvement of individual clients on their caseload. Even in a preventative capacity, experienced clinicians consistently use SIT to treat feeding sensitivities. Though sensory interventions may be less supported in experimental settings than behavioral interventions, they have high social validity among professionals in the field.

The number of subjects varied for each study. It appears that the studies with smaller population sizes yielded more positive results with regard to sensory integration therapy. One interpretation of this finding is that in settings with larger experimental populations, sensory-based interventions decline in effectiveness. Another interpretation is that sensory integration is highly dependent on the individual needs of the client;

methods that address one child's food sensitivities cannot be effectively applied to a different child's feeding difficulties. Effective SIT likely requires a high level of treatment variability, making it difficult to study on a large scale.

This review had several limitations that must be noted. The first limitation is that SIT is a dynamic therapy. Individual plans are essential to the treatment of feeding disorders. Second, many of the subjects who participated in these studies had concurrent diagnoses. This is very common among individuals with developmental disorders. Finally, there are few studies that utilize sensory-based therapies without incorporating behavioral therapy.

Much of the current literature on feeding therapy for autistic children involves all-male populations. This is due in part because ASD is more commonly diagnosed in males than females. Of children meeting the criteria for ASD, the male-to-female ratio is 4 to 1. As a result, this has not yet been a focus of research on the differences in feeding treatment between male and female subjects with ASD. Conducting such a study would first require populations of male and female children with similar diagnoses of ASD to be assembled. The age of subjects is another factor to consider. In this review, children's ages ranged primarily from three to five years, with outliers from ages one to twelve.

The severity of ASD and co-occurring conditions of subjects who participated in these studies were not consistently documented. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V) uses three severity specifiers to describe ASD in regard to how much support the individual needs in their daily life and the severity of their symptoms, with the recognition that severity may fluctuate over time and vary by context. Social communication difficulties and restricted, repetitive behaviors are rated

separately. Level 3 (“Requiring Very Substantial Support”) is the highest level of severity, followed by level 2 (“Requiring Substantial Support”) and Level 1 (“Requiring Support”). Additional diagnoses are common in individuals with ASD. According to the DSM-V, about seventy percent of individuals with autism spectrum disorder may have one comorbid mental disorder and forty percent may have two or more comorbid mental disorders. ASD is frequently associated with specific learning difficulties (literacy and numeracy), structural language disorder, ADHD, developmental coordination disorder, anxiety disorders, and depressive disorders. As previously discussed, avoidant-restrictive food intake disorder (ARFID) is a fairly frequent presenting feature of ASD. Additionally, medical conditions commonly associated with ASD include epilepsy, sleep problems, and constipation (American Psychiatric Association, 2013).

Future research might focus on comparison of SIT in the treatment of male versus female clients, comorbid conditions, different severity levels of ASD, and sensory based therapy with a minimal behavioral component. A study of sensory interventions with a focus on any one of these aspects may provide more substantial support for SIT or more tangibly demonstrate that behavior-based therapy is more effective.

In summary, disordered feeding results in caregiver stress, adverse impact on family functioning, and diminished nutritional quality—which negatively affects a child’s development, health, and overall quality of life. Oral hypersensitivity results in more food refusal and a narrower diet in children with ASD (Chistol et al., 2018). Qualified professionals must address the sensory causes of feeding difficulties in children with ASD, as these do not naturally resolve with age. Each person possesses different needs, skills, and learning potential. Thus, each individual child requires an individualized

feeding plan that utilizes flexible methodology and reduces the severity of the client's sensory feeding concerns in addition to improving their behavioral responses to feeding. The research supports that SIT paired with behavioral interventions provides the high level of treatment variability that is required for effective feeding therapy.

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