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SAY “AH,” NOT “AHHH!” - PARENT INTERVENTION FOR THE REDUCTION OF DENTAL ANXIETY IN A CHILD WITH AUTISM

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ABSTRACT

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The overall oral health status of children with autism is significantly poorer as compared to children without autism primarily due to dental anxiety. High levels of anxiety often contribute to behavioral distress. These difficulties, coupled with deficits in communication and coping skills, result in challenging behaviors for children with autism during routine dental cleanings. Currently, there is limited research on effective treatment packages and procedures for managing dental anxiety in children with autism, and no studies have trained parents as intervention agents to treat dental anxiety in this population. In this single-case study, a parent training intervention was delivered to the mother of a child with autism to determine the effects of the intervention program on the child's anxiety and cooperation. The mother was taught to implement evidence-based intervention practices including systematic desensitization, counterconditioning, in-vivo modeling, and positive reinforcement. She was also taught to implement choice-making, which has not been used to treat dental anxiety in youth with autism. Parent attitudes towards intervention procedures (social validity) was assessed. Results indicate that the mother's confidence increased as well as her ability to implement treatment components. She endorsed that the intervention was feasible, acceptable, and effective. The child's anxiety decreased and cooperation during the dental exam increased. The outcomes of this study contribute to the

paucity of literature on behavioral/psychological procedures to treat fear during dental exams as well as to the nonexistent research on using parent-implemented interventions to decrease dental anxiety in youth with autism.

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When I was seemingly all out of ideas, my dad brilliantly suggested, "kids are afraid of the dentist, can you do something about that?" I don't like the dentist, I love him - thank you, Dr. Nick.

To my mom and my grandparents, who constantly push me to follow my heart and for telling me that, no matter how long and winding the road ahead may seem, time will pass - it's your choice what you do with it. Grandma, we "made it big!" Mom, thank you for being a solution-focused extraordinaire, always quick with a "whatever I can do to help you." I know you quite literally meant *whatever.*

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INTRODUCTION AND LITERATURE REVIEW

Autism spectrum disorder (ASD), which affects one in 36 children (Maenner et al., 2023), is a complex neurodevelopmental disorder that is characterized by difficulties in social communication and social interaction as well as the presence of restricted, repetitive patterns of behavior, interests, or activities (American Psychiatric Association [APA], 2013). One of the largest health care needs that continues to go unmet for children with autism is the need for appropriate oral healthcare (Leiva-García et al., 2019). When children experience poor oral health and hygiene in conjunction with limited access to dental care, an array of difficulties arise that negatively impact their daily functioning, including proper digestion and speech (Leiva-García et al., 2019). In fact, research consistently demonstrates that the overall oral health status of children with autism is significantly poorer as compared to children without autism due to a variety of factors, the main factor being dental anxiety (Kotha et al., 2018; Sahab, 2017). This gap between the oral health status of children with and without autism is widened due to the lack of routine dental care (Kotha et al., 2018). As such, overall quality of life for these children is lower than that of their peers, and they experience a higher rate of invasive, intensive dental restoration procedures resulting from untreated cavities (Bossù et al., 2020; Prekash et al., 2021).

There is a significant relationship between a child's behavior/cooperation during their dental visit and their overall oral health care (Lai et al., 2011). Because these dental visits can be unpleasant for children, they become unpleasant for their parents. In response to these unpleasant visits, parents often engage in reactive, rather than proactive strategies; that is, due to the difficulty parents experience bringing their child to the dentist's office,

instead of bringing their child to the dentist for routine checkups once every six months (proactive), dental visits are made only when the child presents with a more immediate, serious dental issue (reactive) (AlHumaid et al., 2020).

What Makes Dental Exams Challenging?

A child with autism may exhibit uncooperative behavior at the dentist's office due to a variety of factors such as communication impairments, changes in the child's daily routine, sensory hypersensitivity, and especially dental fear/anxiety (Stein et al., 2014). The prevalence of children with autism who experience clinically significant levels of anxiety is an astonishing 69% (Kerns et al., 2020). Most relevant to the present study, Park et al. (2022) found that 68% of children with autism experienced clinically significant levels of anxiety specifically related to dental care. Moreover, children with autism exhibit significantly greater behavioral distress during routine dental care than children without autism (Stein et al., 2014). This may be in large part due to sensory hypersensitivity (which is associated with increased anxiety in youth with autism) and due to the fact that one of the most common fears/anxieties in children with autism is anxiety surrounding changes in routine and novelty (Kerns et al., 2014). Dental visits consist of a large variety of novel stimuli including (but not limited to) novel physical locations, individuals, unpleasant smells, seated positions with bright lights above their head, unpleasant tastes (i.e., toothpaste, latex gloves), and requests (e.g., "say ahhh," "spit it out"). High levels of anxiety and behavioral distress coupled with deficits in communication and coping skills were found to result in challenging behaviors (e.g., aggression, self-injurious behaviors, tantrums, crying, screaming) for children with autism during routine dental cleanings, whereas children without autism who were more physiologically distressed did *not* show

more challenging behaviors during dental cleanings (Stein et al., 2014).

Why Is It Important to Treat Dental Anxiety in Children with Autism?

Traditionally, dental patients who present with challenging behaviors (such as aggression, self-injury, and tantrums) are either put under general anesthesia for their visits or physically restrained (Johnson & Rodriguez, 2013). Research demonstrates that children with autism are more likely than children without autism to undergo either general anesthesia or sedation during routine dental exams, which puts them at higher risk for critical events (Parry et al., 2021). In fact, the use of anesthesia in childhood continues to perpetuate the dental experience as one of fear and unpleasantries well into adulthood (Zhou et al., 2022). Research assessing the attitudes of parents and children without autism towards physical restraint and general anesthesia found overwhelmingly unfavorable opinions toward each; instead, both parents and the children preferred positive reinforcement to be used during dental visits (Mamdouh Talaat, 2015; Acharya, 2017). While anesthesia and physical restraints may be immediately effective, these strategies may be traumatic for parents to witness and for children to experience. Furthermore, they do not address the root cause of the child's challenging behavior – i.e., dental anxiety. Therefore, it is essential to find alternative ways to increase the cooperation (also referred to as "compliance" in the literature) of children with autism during dental visits while respecting their dignity. This can be accomplished by reducing their dental anxiety, which can therefore reduce their need to engage in challenging behaviors to escape dental exams.

Review of the Existing Literature

Currently, there is limited knowledge of effective treatment packages and procedures for managing dental anxiety in children with autism. However, existing

literature demonstrates that the successful use of desensitization techniques, positive reinforcement, modeling, and visual aids in conjunction with one another can result in decreased fear and/or increased compliance for children with autism during dental exams (Luscre & Center, 1996; Cuvo et al., 2010; Orellana et al., 2014; Nelson et al., 2017; Carter et al., 2019; Narzisi et al., 2020). In a review of strategies to increase comfort and compliance with medical/dental routines in individuals with intellectual and developmental disabilities (IDD, including autism), the most common components used to treat fear avoidance and noncompliance with medical/dental routines were *graduated exposure* and *contingent reinforcement* (Kupzyk & Allen, 2019).

Specifically, in the review, all of the interventions for medical/dental anxiety in IDD included ***exposure*** to the feared/avoided stimuli (which includes counterconditioning/systematic desensitization), with 81% conducting these exposures gradually (Kupzyk & Allen, 2019). For example, Luscre and Center (1996) successfully reduced dental fear responses in three children with autism and ID by using ***counterconditioning***, in which they paired anxiety-provoking stimuli with stronger stimuli that elicited anxiety-antagonistic responses (i.e., "anti-anxiety" stimuli). Their treatment package consisted of systematic desensitization (the most common counterconditioning procedure used with children; Center, 1989) with guided mastery, video peer modeling, and positive reinforcement. Results demonstrated a significant increase in the number of steps completed during the dental hierarchy in the analog setting as well as in the in-vivo setting (Luscre & Center, 1996). A similar study conducted by Cuvo et al. (2010) utilized "stimulus fading" (i.e., gradually fading in aversive stimuli such as a mouth mirror, which we would consider to be "graduated exposure" or "gradual exposure") and

counterconditioning (preferred objects available while aversive stimuli were faded in) along with priming, prompting, escape extinction, and differential reinforcement to combat fear and anxiety response during a dental exam in children with autism. Given that counterconditioning (pairing an anxiety-provoking stimulus/situation with an anti-anxiety stimulus) has been found to be more effective in reducing fear and avoidance behavior than traditional extinction (e.g., Hulsman et al., 2023; Newall et al., 2017), **the present study utilized counterconditioning, conducting a preference assessment for the participant to determine his anti-anxiety stimuli that could be paired with the dental exam.** Of note, Cuvo et al (2010) faded out participants' preferred (i.e., anti-anxiety) items upon mastery of each step in the hierarchy, which increased the number of training sessions required to re-master the step without the preferred item. However, it can be argued that fading out coping strategies (such as preferred items) during a strong, anxiety-inducing situation, such as a dental exam, is not necessary due to the infrequent (biannual) nature of routine dental check-ups. As Luscre and Center (1996) note, due to the extreme anxiety elicited by a dental exam, coping strategies may always be necessary. **Therefore, the present study did not fade out the child's highly preferred items (i.e., "anti-anxiety" stimuli) and instead allowed the child to use his anti-anxiety stimuli throughout the entire dental exam to counter his fear response and move successfully through the exam in a comfortable manner.**

In addition to systematic desensitization/counterconditioning, another frequently used component of treatment packages for increasing dental cooperation and/or reducing dental anxiety in children with autism is ***modeling*** – including both *in-vivo modeling* (live or in-person modeling; Orellano et al., 2014) and *video modeling* (Luscre & Center, 1996;

Cuvo et al., 2010; Isong et al., 2014; Orellana et al., 2014; Narzisi et al., 2020). Modeling involves the parent or teacher (or another adult or peer) demonstrating approaching the anxiety-provoking stimulus or engaging in the anxiety-provoking situation while the child observes. Whereas some studies use "in-vivo" or in-person modeling to treat fear/anxiety in children with autism (e.g., Love et al., 1990), other studies use video modeling, However, a participant's engagement with a video, language capabilities, and overall ability to attend to the video must be accounted for when considering the use of video modeling. Further, research has demonstrated that, when used as a sole intervention, video modeling on its own is not effective in increasing compliance during dental exams for children with autism, ID, and other developmental delays and, therefore, will not be a component of this study (Conyers et al., 2004; Isong et al., 2014). Research has shown that in-vivo modeling, also known as live or participant modeling, is effective in improving compliance during a dental exam for children with autism (Orellana et al., 2014). Further, in-vivo modeling was demonstrated to be effective in treating anxiety both in youth without autism during dental treatments (Farhat-McHayleh et al., 2009) and anxiety during a physical exam for children with autism (Gillis et al., 2009). Therefore, ***in-vivo modeling*** was implemented in the current study with the participant's mother modeling the steps of a dental exam using a dinosaur stuffed animal (consistent with the child's special interest)**.**

Parents as Interventionists to Treat Dental Fear/Anxiety

While the aforementioned interventions (particularly graduated exposure and contingent reinforcement; Kupzyk & Allen, 2019) appear to be helpful in treating dental anxiety in children with autism, it is important to consider the time and financial cost of multiple dental visits that would be required to incorporate graduated

exposure/systematic desensitization into routine dental care using the dentists or their staff as the intervention agents. Therefore, exposing children to a dental exam in an analog dental setting (i.e., their home) with parents as the primary intervention agents may be the most cost-effective, feasible, and accessible strategy. Despite the benefits of using parents as interventionists, all prior studies treating dental fear/anxiety and cooperation in children with autism utilize either oral health professionals or experimenters/researchers to implement treatment (Luscre & Center, 1996; Cuvo et al., 2010; Isong et al., 2014; Orellana et al., 2014; Nelson et al., 2017; Carter et al., 2019; Narzisi et al., 2020). While one study used parents as interventionists to improve at-home daily oral health habits (tooth-brushing) and decrease plaque accumulation in children with autism (Fenning et al., 2022), this study did not target anxiety during or compliance with dental office visits. In fact, there has been no study to date treating the fear/anxiety exhibited by children with autism during a dental exam that uses parents as the interventionists**. As such, this study is the first to treat dental anxiety in a child with autism in which treatment is implemented by a parent.**

Previous research found that parents are indeed able to acquire skills to implement evidence-based interventions when properly supported and trained (Meadan et al., 2016). Parents of children with autism who are trained in specific interventions have children who show continued improvement even when other therapeutic services are terminated; due to constant access to their parent, the child does not regress in skill acquisition (Prata et al., 2018), thus promoting maintenance of skills over time. When parents are equipped to better manage their child's behavior, the parent-child relationship is strengthened (Prata et al., 2018). Finally, training parents allows for increased access to services when there are

limited providers and enables parents to individualize strategies when interacting with their child (Symon, 2005). At this time, the amount of oral health care professionals adequately trained or specialized in children with developmental disabilities, including autism, is low (Narzisi et al., 2020). Due to the limited number of dental professionals equipped to treat children with autism, it is imperative that parents can prepare their children as much as possible prior to dental visits. Parent time and ability to perform these procedures with high treatment integrity must be taken into consideration when determining whether this treatment package is appropriate for a particular family.

Gaps in the Existing Literature

There are some significant gaps in the literature regarding interventions for children with autism who are anxious during dental visits. First and foremost, the existing literature regarding the reduction of dental anxiety in children with autism uses interventions implemented by an oral health professional, such as a dentist or dental hygienist, or by a researcher/experimenter (e.g., Cuvo et al., 2010; Elmore et al., 2016; Luscre & Center, 1996; Octavia, 2021). There is currently no study that focuses on treating fear/anxiety during a dental exam in children with autism that utilizes parents as the interventionists. Thus, the present study will train a parent of a child with autism to be the interventionist in treating her child's dental anxiety. The primary purpose of this study is to promote parent independence by equipping them with the knowledge and tools to assist their child in this process with minimal to no support from outside agencies or personnel once skills are acquired.

Second, research suggests that, when children with autism are provided are provided with choice-making opportunities in either selecting their own reinforcement

and/or in selecting instructional tasks, there is a reduction in challenging behaviors, particularly behaviors maintained by escape, and a corresponding increase in both correct responding and task engagement (Dyer et al., 1990; Moes 1998; Howell et al., 2019). Choice-making may decrease a child's challenging behavior due to a decrease in anxiety, which may result from the child's increased feelings of control over their environment and a sense of increased predictability in knowing what will come next (Mithaug, 2003). No study to date has assessed the impact of choice-making on anxiety or challenging behavior for children with autism during a dental exam.

Third, incorporating a child's special interest into a treatment to decrease anxiety in children with autism is a relatively under-researched area, at least relative to the literature on embedding special interests to target social communication behaviors, task-engagement/accuracy/productivity, or disruptive or off-task behavior in children with autism (Ninci et al., 2019). Intense interests or "special interests," which are interests characterized by their high intensity or unusual focus (called "circumscribed or perseverative interests" in the DSM-V) are a core feature of ASD. Although parents of children with autism report that their child "incessantly" talking about their special interest is one of the most difficult aspects of autism to manage (South et al., 2005), several evidence-based cognitive-behavioral therapy (CBT) packages targeting anxiety in children with autism actually leverage their special interests, incorporating the child's special interests into therapy to increase the child's engagement (e.g., Wood et al., 2020). Studies have demonstrated the importance of using a special interest for people with autism as a coping skill to decrease anxiety and increase self-regulation during anxiety-provoking social situations (Moree & Davis, 2010; Kerns et al., 2016).

Current Study and Hypotheses

Research has demonstrated that exposure/desensitization, visual aids, modeling, and contingent positive reinforcement are all effective in increasing compliance during a dental exam for children with autism when administered by dental professionals, researchers, and school/residential staff members (Luscre & Center, 1996; Cuvo et al., 2010; Orellana et al., 2014; Carter et al., 2019; Narzisi et al., 2020). Furthermore, counterconditioning (i.e., pairing an anti-anxiety stimulus with the anxiety-provoking situation) has also been shown to be effective in decreasing anxiety for both children and adults with autism in various situations (Cuvo et al., 2010; Luscre & Center, 1996). Thus, the primary purpose of this study was to examine whether a behavioral intervention package delivered by a parent in the child's home would decrease dental anxiety and increase dental cooperation in a child with autism.

The researcher hypothesized that, first, the child would exhibit decreased anxiety during a dental exam conducted at a dentist's office following a parent-implemented behavioral intervention and, second, the child would exhibit increased cooperation during a dental exam conducted at an dentist's office following a parent-implemented behavioral intervention. Third, the researcher hypothesized that, post-treatment, the parent would have a positive attitude towards the treatment procedures (methods) and treatment outcomes, demonstrating treatment acceptability. It was anticipated that, while the intervention is cost-effective, it may be time-consuming for parents. However, it was predicted that the parent would endorse that the time put into learning these techniques initially was worth the outcome. Lastly, it was hypothesized that results would be generalized for the participant in this study from the analog dentist office (i.e., home) to

the actual dentist's office. Because their parent will have an understanding of how to properly implement intervention components throughout the study with support from the researcher, it is predicted that the parent would be equipped to prepare their child for subsequent dental visits beyond the conclusion of the current study. Finally, parents may find the overall concepts of positive reinforcement, systematic desensitization, and counterconditioning to be helpful for their child across other anxiety-provoking situations.

METHOD

Participants

"Dominick" (pseudonym), a biracial (White and Asian), 6-year-old boy with autism and his mother, "Nina," participated in the current study. The parent-child dyad was recruited from an applied behavior analysis agency in Long Island, New York. Nina indicated that Dominick is able to understand most basic instructions and questions and is able to communicate his basic needs, wants, and some ideas. He is currently a first-grade student placed in a private school for children with disabilities. Dominick's most recent Core Language score on the Clinical Evaluation of Language Fundamentals-5 (CELF-5) was a standard score of 78 (7th percentile), meeting the requirement of at least a score of 71 (3rd percentile) to participate in this study. Additionally, his most recent cognitive testing via the Stanford-Binet Intelligence Scale – 5th edition revealed that Dominick's Nonverbal IQ falls at a standard score of 83 (13th percentile) and his Verbal IQ falls at a standard score of 71 (3rd percentile). Achievement testing conducted using the Woodcock-Johnson- revised demonstrated that his academic skills are intact: Applied Problems (25th percentile), Calculations (80th percentile), Letter-Word Identification (91st percentile), Passage Comprehension (85th percentile), and Spelling (86th percentile). At home, Dominick lives with his mother, father, younger sister (3 years), and dog. He requires support for some activities of daily living (e.g., brushing his teeth, getting dressed) and at times is prompt-dependent.

During dental exams, Dominick has a history of engaging in a variety of interfering behaviors (also referred to as "challenging behaviors" in the literature) including crying, screaming, physically turning away, refusing to sit in the chair, covering his mouth, and

either holding or pushing the dentist's hands/tools away from his face. Nina shared the methods she used to navigate Dominick's last routine dental exam which included watching a peer, discussing what will happen during the exam, and restraint. Dominick has a long-standing history of requiring physical restraint at the dentist's office in order for his dentist to be able to conduct routine dental exams. Restraint involved Dominick laying on his mother with his feet and arms held down by both her and an office staff member.

Inclusion criteria for the parent-child dyad was as follows: (1) the child was diagnosed with autism spectrum disorder, as diagnosed by a licensed psychologist; (2) the child was between the ages of 4 and 10 years old; (3) the child was able to follow one and two-step directions, which was confirmed during the in-person interview; (4) the child's language ability was greater than or equal to a score of 71 on the CELF-5; (5) the parent was willing to participate in the parent training sessions; (6) the child had a fear of the dentist/dental procedures, confirmed by the parent and via direct observation by the researcher during the pre-intervention probe at the dentist's office; and (7) the child was not receiving any additional intervention to address their dental anxiety. Upon the conclusion of the study, the mother was compensated with a $50 Amazon gift card.

Setting and Materials

The author met with the mother at the family's home where Nina completed the consent form (Appendix A), demographic questionnaire (Appendix B), and pre-intervention questionnaire assessing her knowledge of and comfort with the intervention components (Appendix C). At this time, Dominick was read an assent form (Appendix E).

The pre-intervention probe occurred at the office of the child's current dental

provider, as did the post-intervention generalization probe. Baseline observations occurred in the participant's home, as did the parent training session. Prior to the training session within the participant's home, the researcher (A.V.) assisted the parent in the creation of a mock dental environment consisting of the mirror, explorer, reclining chair, dental bib and clip, dental mask, latex gloves (for parent to wear), and overhead light. The selected reinforcer was kept out of reach until needed for contingent reinforcement. The "anti-anxiety" stimuli (which incorporated his special interests in space and dinosaurs) included a space blanket, orange sunglasses referred to as "space goggles," a space projector that projected planets and stars onto the ceiling, and a dinosaur plush used for modeling subsequent steps in the dental exam. These items were paired with the dental exam in that they were accessible throughout the mock dental exam, but inaccessible to the child throughout the rest of the day or in any other context outside of dental procedures. Sessions were recorded by both the researcher and the parent.

Measures

Child's Anxiety

The primary dependent variable or outcome measure was the child's level of anxiety, which was assessed in three ways.

Percentage of steps completed in fear hierarchy. First, the percent of steps completed successfully within the 10-step dental hierarchy (i.e., fear hierarchy) was calculated as the main measure of Dominick's anxiety (see Appendix F for hierarchy). Successful completion of a step was defined as responding to the parent's request (e.g., child opens his mouth when asked to say "ahh") or allowing the parent to conduct that step of the exam (e.g., tolerates dental light) without challenging behaviors or escape behaviors.

Sessions were recorded by the researcher (pre-intervention probe, parent training session, intervention sessions, and post-intervention generalization probe) and the parent (baseline sessions and post-intervention sessions). Videos were coded by the researcher and two research assistants.

Venham Anxiety and Behavior Rating Scale. Second, the Venham Anxiety and Behavior Rating Scale (Narayan & Samuel, 2020) was used as an additional measure of the child's anxiety (Appendix H). This scale uses a six-point rating system ranging from 0 to 5 (in which 0 indicates no anxiety and 5 indicates maximum anxiety) and was completed independently by the research assistants and the investigator after viewing video recordings of each session. At the conclusion of the 10-step dental hierarchy, the raters selected the appropriate point on the scale that was most indicative of the child's overall level of anxiety in the video (i.e., the child's overall anxiety displayed through all the steps of the hierarchy). Data on this scale was collected for the pre-intervention probe, baseline phase, post-intervention trials, and post-intervention generalization probe.

Anxiety Rating Scale. Third, a subjective measure of anxiety, the Anxiety Rating Scale (Liu et al., 2022; see Appendix K) was provided to the parent so that she could evaluate her impression of her child's anxiety during each intervention and post-intervention trial. The Anxiety Rating Scale is a scale that uses smiley faces that progress from happy to extremely anxious in six increments. This scale has acceptable measurement properties, including content validity, construct validity, criterion validity, and test-retest reliability (Liu et al., 2022).

Child Compliance (Cooperation)

Venham Behavior Rating Scale. The child's cooperation or compliance with the

dental exam was measured as a secondary outcome variable using the Venham Behavior Rating Scale (Narayan & Samuel, 2020; Appendix I). Like the Venham Anxiety and Behavior Rating Scale, this scale also ranges from 0 to 5 (except in the opposite direction, with 0 being total cooperation/compliance and 5 being no compliance) and was completed by both the investigator and the research assistants via video recording. A rating was selected to indicate the child's level of compliance during the entire recording (i.e., overall compliance with all of steps of the hierarchy that were completed or not completed in the video). Data on this scale was collected for the pre-intervention probe, baseline phase, post-intervention trials, and post-intervention generalization probe.

Social Validity

Social validity includes the social appropriateness of the procedures (whether participants and caregivers view the treatment procedures as acceptable and easy to implement; i.e., treatment acceptability and feasibility) and the social importance of the effects (whether consumers are satisfied with the results) (Wolff, 1978). Parent attitudes, confidence, and overall satisfaction were measured, as was treatment acceptability and feasibility, via two separate questionnaires. The first questionnaire (administered to Nina pre- and post-intervention) measured the parent's confidence, knowledge, comfort level, and need for support regarding behavior interventions (Appendix C). Content of this survey assessed the following: 1. Parent confidence in delivering each intervention component; 2. Parent knowledge of and/or training in behavior principals; 3. Parent comfort level when taking their child for a dental visit; 4. Level of support the parent currently requires assisting their child in a successful dental visit. The second social validity measure (administered to Nina at the conclusion of the study) assessed treatment

acceptability, feasibility, and perceived effectiveness (Appendix D).

Experimental Design

A single-case AB design (Kazdin, 1982) was used to examine whether this parent-mediated behavioral intervention helped reduce the child's dental anxiety and increase his cooperation with the dental exam. An AB single-case design is typically utilized in research studies consisting of a small number of participants (e.g., Karimi et al., 2011; Misquiatti et al., 2014; Reid et al., 1993) and, therefore, was most appropriate for this study. This type of design involves collecting baseline data on the dependent variables (phase A). Phase A allows the researcher to determine the participant's current level of anxiety and cooperation pre-intervention. Next, the intervention is introduced in what is referred to as phase B. This design was also selected because AB designs are the most commonly used type of design in applied settings such as schools, homes, recreational activities, and clinics (Tawney & Gast, 1984). An AB design can result in preliminary objective data on the correlation between an intervention and outcome variables (Byiers et al., 2012). Data for this study was collected during the pre-intervention probe, at baseline, during the intervention, and at generalization.

Phases

There were five phases in the current study. First, the **pre-intervention probe**, which took place at the child's bi-annual dental exam at his dentist's office. Second, three **baseline** observations were conducted by the child's mother at their home. Third, the researcher (A.V.) conducted a **parent training session** with the parent only (without Dominick present), in which Nina was taught the intervention components and rehearsed with the researcher until acceptable treatment fidelity was reached (100% across 3 trials).

Fourth, the parent implemented the **intervention** with the child, in which the researcher was present for coaching (immediate feedback) and only steps 1-9 of the dental hierarchy were introduced. Once the parent demonstrated that she could conduct the intervention with the child in a reliable manner (100% across 3 trials), she entered the **post-intervention** phase, in which Nina presented the hierarchy in its entirety (i.e., all ten steps of the hierarchy) to the child without the researcher present. The fifth and final phase was the **post-intervention generalization probe**, in which the child attended a dental visit at his dentist's office.

Procedures

Preference Assessment

Prior to each intervention and post-intervention trial, an informal preference assessment was conducted by Nina in which she asked Dominick what he wanted to work for that day as contingent reinforcement (given for successful completion of the current step in the dental hierarchy). Google maps, a YouTube video, and an iPad game were highly preferred, isolated reinforcers during this time used exclusively for contingent reinforcement. The preferred interest used for the non-contingent reinforcement materials was outer space and dinosaurs.

Pre-Intervention Probe and Baseline Phase

During the baseline phase, Nina was asked to say, "Okay, Dominick, it's time to go to the dentist!" as a discriminative stimulus (S^D). Baseline data was collected across 3 sessions. After Nina stated the S^D, she was instructed to respond as she typically would to Dominick. For example, if he walked to the room and walked out, data collection stopped at that point and the trial ended. The rest of the hierarchy was not presented beyond that

point. Nina was not taught intervention strategies prior to the baseline phase.

Prior to baseline observations conducted in the intervention setting (the participant's home), a pre-intervention probe was conducted in the generalization setting (the dentist's office) by observing Dominick at a dental visit with his current dental provider. This dental visit provided information regarding where the child fell on the dental hierarchy as well as initial ratings on the Venham Anxiety and Behavior Rating scales. Baseline data collection and intervention sessions occurred within the participant's home and were done by his mother (Nina), who sent a video recording of these observations to the researcher (A.V.)

Intervention

In the Intervention phase, Dominick was presented with portions of the hierarchy (steps 1 through 9), in line with the gradual nature of graduated exposure, using a forward chain presentation (stopping at whatever the current step was at that time).

Prior to beginning the intervention with Dominick and his mother together, the researcher (A.V.) conducted a parent-only training session in the family's home with Nina (without Dominick present). During this training session, Nina was oriented to completing each step in the dental hierarchy by the researcher. The researcher trained Nina on how to implement the intervention strategies using didactic training (psychoeducation), in-vivo modeling of each strategy for the mother, coaching the mother on the use of each strategy (with performance feedback), and the eventual fading of support (Lang et al., 2009; Meadan et al., 2016). For Nina to move on from the training portion with the researcher to implementing the intervention with her child, she had to demonstrate that she could do so accurately and independently. After Nina demonstrated that she could implement each

intervention component independently across three consecutive trials without prompting or feedback, she moved on to implementing the intervention with her son. Nina was trained to implement the following five intervention strategies:

Graduated Exposure. Graduated or gradual exposure is the process of slowly and repeatedly introducing aspects of an experience to an individual to essentially desensitize a fear response while positively reinforcing approach/acceptance responses (Hagopian & Jennett, 2008). Graduated exposure was selected as an intervention in the present study because, in the review of interventions to increase comfort and cooperation with medical/dental routines in people with IDD (Kupzyk & Allen, 2019), all of the interventions included some type of in vivo exposure to the feared/avoided stimuli and 81% conducted these exposures gradually. Nina presented the fear/avoidance hierarchy (dental hierarchy, Appendix F) as a traditional, forward chain task analysis, requiring the successful completion of the current step prior to moving forward to the following step.

Positive (Contingent) Reinforcement. The next component of the intervention, known as contingent positive reinforcement, was provided to Dominick after (or contingent upon) the successful completion of the current step in the hierarchy. Contingent reinforcement was selected as an intervention in the present study because, in the aforementioned review (Kupzyk & Allen, 2019), the most common interventions used to treat fear/avoidance and noncompliance with medical/dental routines were graduated exposure and contingent reinforcement, with 81% of studies including reinforcement contingent on desired behavior (usually in combination with graduated exposure; 72% of studies). When Dominick completed the given step(s) in the hierarchy, he immediately received verbal praise and his contingent reinforcement (e.g., iPad). To increase and

maintain the potency of the reinforcer, Nina isolated a select few highly reinforcing items and videos that Dominick could only access when completing steps on the dental hierarchy.

Counterconditioning (Noncontingent Reinforcement). Whereas certain reinforcers (e.g., iPad) were provided to Dominick contingent upon or *after* completion of steps in the dental hierarchy, other reinforcers (e.g., space items) were paired noncontingently with dental stimuli *during* the dental exam (as in counterconditioning). Counterconditioning involves presenting fear-producing stimuli in the presence of other stimuli (i.e., "anti-anxiety" stimuli) that elicit responses incompatible with fear (Ollendick & King, 1998); that is, the anxiety-provoking stimulus is paired with "anti-anxiety" stimuli. With counterconditioning, the child is systematically exposed to their conditioned fear scenario (e.g., dentist's office) while engaging in a distracting, preferred activity that is already associated with extreme joy and/or relaxation. The response to the preferred activity is, therefore, incompatible with the feeling of anxiety (Slifer et al., 2011).

Incorporating Special Interests. Incorporating an individual's preferences or interests into a "disliked" or "unpleasant" activity is an antecedent intervention that has been shown to reduce escape-maintained challenging behavior (Clarke et al., 1995). To counteract anxiety, it may be especially helpful to incorporate not just the child's interest, but his/her most *strongly preferred* "special interest" (an object, activity, or topic with which the individual is intensely preoccupied). Emergent research has demonstrated evidence for incorporating preferred interests to decrease levels of anxiety in autistic youth (e.g., Keefer et al., 2018; Wood et al., 2020). For Dominick, outer space and dinosaurs were selected as his current most strongly preferred interests. Therefore, the dental

environment incorporated a dinosaur for in-vivo modeling, a space-themed blanket to lay on the dental chair, "space goggles" (orange-tinted sunglasses), and a projector that projected planets and stars onto the ceiling. Of note, "Incorporating special interests into the intervention" was not listed as a separate intervention component on the Treatment Integrity Checklist (Appendix G) because it was part of counterconditioning, meaning that access to these highly preferred space-themed items and the stuffed dinosaur (i.e., "anti-anxiety" stimuli) was given to Dominick simultaneously with – or paired with – the presentation of the anxiety-provoking stimuli in the dental hierarchy (i.e., counterconditioning).

In-vivo Modeling. In-vivo modeling (also known as "participant modeling") involves the participant observing a live model demonstrating a positive or neutral approach response (i.e., approaching the feared stimulus), tolerating the feared stimulus, or using coping strategies when approaching or interacting with the feared stimulus or situation (Gillis et al., 2009). Live modeling or participant modeling has been shown to be effective in reducing children's anxiety during dental treatments for youth without autism (e.g., Farhat-McHayleh et al., 2009), in treating fear of routine physical exams in children with autism (e.g., Gillis et al., 2009), and in improving cooperation/compliance with a dental assessment in children with autism (Orellana et al., 2014). In this study, the model was the stuffed dinosaur. In-vivo modeling was done by Nina for each current step. Once Dominick completed the hierarchy up to but *not* including the current step, Nina paused, modeled/demonstrated that step on the dinosaur, then stated, "Okay, it's your turn." Nina presented the dental materials in a coordinated fashion as she narrated each step (e.g., "the dino is getting on his bib, now he is opening his mouth").

Providing Choices. On two select steps of the hierarchy, Nina provided Dominick with a choice as to which step he would like to complete next. The choices steps were step 5 (either turn on the light or put on the bib) and step 9 (either use the mirror or explorer first). Whichever choice Dominick selected during that trial was what was done first. The option that was not selected by Dominick immediately followed the chosen step. For example, if he chose to turn on the light first, then the bib followed.

Post-Intervention Phase

During the Post-Intervention phase, Dominick was given the opportunity to perform all 10 steps of the hierarchy. Nina stated the S^D and proceeded to independently implement the treatment package with her son. All sessions were recorded by Nina and took place at her home.

Generalization Probe

During the post-intervention generalization probe that occurred after the intervention at the participant's home, Dominick attended a dental visit at his dentist's office. The researcher (A.V.) arrived early to the appointment and dressed the room utilizing the anti-anxiety stimuli (e.g., placing the space blanket on the dentist chair with the dinosaur sitting on top of it). Additionally, fluorescent lights were turned off, the planet projector was turned on, and Dominick was provided with his space goggles upon entering the room. At the time of this visit, Dominick was highly interested in the Minions movie. His dentist's office has a television in the operatory that is located on the ceiling so that it can be seen when a child is laying down in the dental chair. Therefore, the researcher (A.V.) requested that the dentist put the Minions movie on the television so that anti-anxiety stimuli incorporating his special interests (Minions, space) could be paired with

the dental exam. When Dominick arrived, Nina handed him the space goggles and stated the same S^D used at home: “Okay, Dominick, it’s time to go to the dentist, let’s put on your space goggles!”

Interobserver Agreement (IOA)

Two masked (blinded) raters were involved in the study. These raters are students in an undergraduate psychology program. The researcher (A.V.) trained each rater to code the percentage of steps completed in a dental exam hierarchy as well as code for anxiety using the Venham anxiety rating scale and noncompliant (uncooperative) behavior using the Venham behavior rating scale. These trainings consisted of watching sample videos of children during a dental exam displaying varying degrees of anxiety and noncompliant behavior. Once the raters achieved 80% agreement with the researcher across two consecutive practice videos for each of the three dependent variables (% of steps completed in hierarchy, anxiety scale, behavior scale), training was considered complete. Interobserver agreement (IOA) was monitored by the researcher double-coding all recorded sessions.

The steps completed on the 10-step dental hierarchy were compared (between the R.A. and the researcher) on an item-by-item basis. IOA was calculated by dividing the number of agreements (i.e., both raters rating “yes” the step was completed or “no” the step was not completed) by the total number of agreements plus disagreements and multiplying by 100. For the Venham anxiety rating scale and Venham behavior rating scale, agreement was defined as both raters scoring the same number (0, 1, 2, 3, 4, or 5) or within 1 point of each other on each scale. On both the Venham Anxiety and Behavior Rating Scale and the Venham Behavior Rating Scale, IOA between the two raters was

100%. Agreements on the dental exam hierarchy are defined as raters scoring the identical number of steps completed during the hierarchy. IOA for the percentage of steps completed during the hierarchy across all four phases was 100%.

Parent Treatment Fidelity

Parent Use of Strategies. Treatment Fidelity (also known as "Intervention Fidelity" or "Intervention Integrity") assesses whether an intervention is implemented as it was intended to be implemented. Selected strategies that were explicitly taught and rehearsed with Nina included: 1. counterconditioning (noncontingent reinforcement incorporating special interests), 2. In-vivo modeling, 3. Graduated exposure, 4. Contingent positive reinforcement, and 5. Providing choice-making opportunities. Parent implementation of these five strategies was assessed via the Treatment Integrity Checklist (Appendix G) by a masked rater and the researcher. Nina was provided with a simple script that she could reference during the parent training sessions that indicated at what points she would implement a given strategy (see sample in Appendix L). During the intervention and post-intervention phases, Nina indicated her perception of Dominick's overall level of anxiety during each trial. This data was collected via data sheets consisting of a smiley face anxiety rating scale (Appendix K).

Nina did not implement any of these strategies during Baseline. During the parent training and intervention phase, however, Nina successfully presented noncontingent reinforcers (pairing them with dental stimuli) 100% of the time. During the parent training portion, Nina modeled the current step of the hierarchy on the dinosaur 78% of the time. During the intervention phase, Nina correctly modeled the current step 74% of the time. She was able to provide contingent reinforcement on the current step 78% of the time

during parent training and 91% of the time during the intervention phase. Finally, during the parent training phase, Nina provided a choice 89% of the time, and was able to do so 100% of the time during the intervention phase.

Data Analysis

The effect of intervention was primarily evaluated using visual analysis of level, trend, variability, consistency, immediacy, and overlap across phases (Ledford et al., 2018). Additionally, to quantify the magnitude of intervention effects, we used Nonoverlap of All Pairs (NAP; Parker & Vannest, 2009), a nonparametric effect size calculation that compares each data point from phase A (e.g., baseline) to each data point from phase B (e.g., intervention). This method allows for the measure of change between individual data points from phase A to phase B. Over 200 published AB studies have tested NAP, utilizing it as an index of data overlap between phases in single-case research (Parker & Vannest, 2009). NAP outperformed other methods of single-subject effect size such as Percent of Nonoverlapping Data (PND), Percent of Data Points Exceeding the Median (PEM), Percent of All Nonoverlapping Data (PAND), and Pearson's R (2) (Manolov et al., 2016; Parker & Vannest, 2009). Further, because NAP includes all data points, it is less influenced by outliers and a small number of data points (Parker et al., 2011). According to guidelines from Parker and Vannest (2009), NAP scores from .00 to .65 are considered weak effects, scores from .66 to .92 are considered moderate effects, and scores from .93 to 1.00 are considered strong effects.

RESULTS

Child Anxiety

BAT: Percent of Steps Completed on Dental Hierarchy

During the baseline observations at the participant's home, Dominick was able to complete an average of 3% (SD = 5.6, range = 0-10%) of the hierarchy across 3 trials presented over three days. During the Intervention phase, in which partial presentation of the hierarchy was conducted for 17 trials, Dominick successfully completed 100% of the steps presented to him in the partial hierarchy during 13 of the 17 trials. Partial presentation ranged from the presentation of 1 step to the presentation of up to 9 steps of the hierarchy (consistent with the gradual nature of systematic desensitization or gradual exposure). Dominick missed one step in the other 4 trials (completing 6 out of 7 steps, 6 out of 7 steps, 7 out of 8 steps, and 8 out of 9 steps presented). During the Post-Intervention phase that included the hierarchy presented in its entirety (all 10 steps), Dominick completed 100% of the steps in each trial. This occurred across the span of 6 days, one trial per day. Using visual analysis, a clear upward trend is seen from baseline through intervention and into the post-intervention generalization probe (Figure 1). The figure depicts little variation and general stability within the intervention phase (M = 97%, SD = 5.6, range = 86%-100%), and post-intervention phase (M = 100%, SD = 0). Further, the level of responding is low in the baseline phase and increases significantly to a high level during the intervention, post-intervention, and post-intervention generalization probe. For this study, data was separated into 3 levels of responding (Cooper et al., 2007). A low level ranged from 0%-35% of steps, a moderate level ranged from 36%-65% of steps, and a high level ranged from 66%-100% of steps completed. No overlap was seen across baseline,

intervention, and post-intervention generalization. There was overlap between intervention and the post-intervention phase, with more stability and consistent responding in the post-intervention phase.

The NAP for datapoints from baseline to the post-intervention generalization probe is 1.0, indicating that each intervention datapoint and the generalization probe data point are higher than those in baseline, which indicates a strong effect of the intervention (Parker & Vannest, 2009). During the pre-intervention generalization probe that took place at the dentist's office prior to the baseline and intervention sessions at home, Dominick completed only 20% of the hierarchy independently. During the post-intervention generalization probe at his dentist's office, Dominick completed 70% of the hierarchy independently. The NAP for datapoints from baseline to the post-intervention phase (including intervention and post-intervention datapoints) is also 1.0, indicating that the data points in the intervention and post-intervention phases are higher than those in baseline. Once more, this demonstrates a strong intervention effect.

Anxiety Rating Scale

On the Venham Anxiety and Behavior Rating Scale (a scale of 0 to 5 in which 0 indicates no anxiety and 5 indicates maximum anxiety), Dominick's anxiety was rated as an average of '3' during the Baseline phase at home and was reduced to a '0' across all parent-implemented intervention sessions during the Post-Intervention phase at home. Data was graphed an analyzed for the entire hierarchy only, known as the Post-Intervention phase. During the generalization probes at the dentist's office, Dominick's anxiety was rated as a '4' prior to intervention and as a '1' post-intervention (Figure 2). Visual analysis indicates a significant decreasing trend in anxiety ratings from the pre-intervention probe

through the Post-Intervention phase. Little variability is shown during the baseline (M = 3, SD = 0.6, range = 3-4). and Post-Intervention phase (M = 0, SD = 0, range = 0). A high level of anxiety is seen during the pre-intervention probe and for the mean at baseline. A low level of anxiety is depicted at the Post-Intervention phase and at the Post-Intervention Generalization probe. The NAP for the Anxiety Rating Scale was 1.0, from Baseline to Post-Intervention, indicating a strong effect and supporting the results from the hierarchy (Parker & Vannest, 2009).

Parent Ratings of Anxiety

The use of a parent-rated scale provided qualitative information regarding how Nina perceived Dominick's anxiety across trials (see sample in Appendix L). Nina's data was obtained during her 23 intervention trials with Dominick, including partial hierarchy and the full 10-step hierarchy. Her ratings mirrored the ratings of the Venham Anxiety and Behavior Rating scale. Each face was assigned a rating of 1 (completely content) to 6 (extremely anxious). Nina rated Dominick's anxiety levels to be an average of 1.13 with ratings going no higher than a 3 (first presentation of mirror or explorer choice step.)

Child Compliance (Cooperation)

Venham Behavior Rating Scale

The Venham Behavior Rating Scale (VBRS) was used to rate the level of cooperative or compliant/noncompliant behavior Dominick exhibited during each trial in each phase of this study. Similar to the Venham Anxiety and Behavior Rating Scale, this scale utilizes a rating of 0 (total compliance) to 5 (no compliance). Dominick's cooperation (compliance) was rated an average of '4' during the Baseline phase at home and improved to a '0' across each parent-implemented intervention session during both the Intervention

and Post-Intervention phases conducted at his home. During the pre-intervention probe at the dentist's office, Dominick's cooperation/compliance was rated a '4.' This improved to a '1' during the post-intervention generalization probe at his next dental visit (Figure 3). The NAP for the VBRS is a 1.0 from Baseline to Post-intervention, indicating a strong treatment effect on noncompliant (uncooperative) behavior in addition to anxiety (Parker & Vannest, 2009). Visual analysis demonstrates a significant decrease in non-compliant behavior from the pre-intervention probe to baseline, from baseline to the intervention, and from the intervention to the post-intervention generalization probe. Little variability is shown at baseline (M = 4, SD = 0.6, range = 4-5) and during the intervention (M = 0, SD = 0).

Social Validity

Nina was given a questionnaire to assess her confidence and familiarity with intervention strategies both Pre- and Post-Intervention. Prior to the parent training sessions, she rated herself as "Very Confident" that she could implement learned intervention strategies with little to no support. At the time, she was "Not At All Familiar" with systematic desensitization but would be "Comfortable" with that strategy. Similarly, Nina endorsed that she was "Not At All Familiar" with in-vivo modeling but would be "Very Comfortable" implementing this strategy. Nina rated herself as "Familiar" with positive reinforcement and "Very Comfortable" with this strategy. Although Nina is "Very Likely" to schedule Dominick's routine dental visits, she rated that she only feels "Somewhat Comfortable" doing so. Nina rated Dominick's current needs at the dentist as "Support - continuous verbal prompting and restraint at times."

Post-intervention, Nina was provided with the same questionnaire. She rated

herself as being “Familiar” with the intervention strategies and “Comfortable” implementing systematic desensitization and in-vivo modeling. Nina’s rating of “Very Comfortable” while providing positive reinforcement remained the same. She is “Very Likely” to take Dominick to his next dental visit, and her rating of comfort doing so increased to “Comfortable.” Nina rated Dominick’s level of support the same as she did during pre-intervention, “Support - continuous verbal prompting and restraint at times.”

Nina was provided with a second post-intervention questionnaire assessing social validity (treatment acceptability, feasibility, and perceived effectiveness). She “Strongly Agreed” that she gained a better understanding of behavior principles, found the parent training component to be helpful and simple, feels better equipped to prepare her son for dental visits, and that she is more comfortable taking her son to the dentist (Appendix D). Nina rated that she “Strongly Agrees” that Dominick’s overall quality of life has improved after the study. She did not rate the intervention as effortful and was “Neutral” regarding the intervention being time-consuming. Finally, she “Strongly Agrees” that participating in this study was worth the time and effort that she put into it.

DISCUSSION

The purpose of this study was to examine the effects of a parent-implemented intervention package on the anxiety of a child with autism during a dental exam. The findings of the present study contribute to the growing literature around dental anxiety in children with autism. First, this study demonstrates that a home-based, parent-implemented intervention that incorporates evidence-based interventions can be effective in decreasing dental anxiety. A decrease in the child's anxiety was accompanied by an increase in his cooperation, which supports previous literature demonstrating a significant relationship between a child's anxiety levels and their cooperation during dental procedures (Lai et al., 2011).

The findings of this study provide initial evidence in support of the creation of a personalized parent-implemented intervention for parents of children with autism and dental anxiety. Results support the use of gradual exposure/systematic desensitization, counterconditioning, in-vivo modeling, contingent reinforcement, and choice-making opportunities to decrease dental anxiety in children with autism. It is important to note that the results of the current study indicate support for a multicomponent intervention package, as that is considered to be the best practice for youth with autism. As a result, we cannot distinguish the contributions made by each individual intervention component. Therefore, future research could assess the effects of each component via a component analysis and dose analysis to assess the components of the intervention package that are truly necessary to yield both immediate and long-term effects.

Following the intervention, the participant (Dominick) demonstrated a decrease in anxiety during a mock dental exam at his home, allowing him to tolerate and complete the

dental exam with increased cooperation. These treatment effects generalized to a real-life dental exam at his dentist's office when Dominick attended his 6-month check-up appointment. After the intervention was implemented, Dominick no longer required the use of restraint during the dental exam (as he had prior to the intervention). This demonstrates that not only was the treatment package successful in decreasing anxiety and increasing cooperation with the mock dental exam at home, but results generalized to an actual dental exam in the real-life setting (the dentist's office). Moreover, Dominick's mother Nina rated the intervention as acceptable, feasible, and effective; she now feels equipped to continue to prepare her child for future dental visits beyond the conclusion of this study.

The present study demonstrates that it is possible for parents to acquire the knowledge and skills necessary to implement evidence-based interventions with their children with high integrity when properly supported (Meadan et al., 2016). Due to the lack of properly trained oral health care providers, it is imperative for parents to be able to prepare their children in advance for dental experiences (Narzisi et al., 2020). Additionally, exposing children to a systematic desensitization program at a dental office or clinic would be both time-consuming and financially draining. This study provides initial evidence that performing a dental exam on children with autism in their home with their parent as the primary intervention agent may be the most cost-effective, feasible, and accessible strategy. When parents and children are able to tolerate the dental exam, parents are more likely to take their child to the dentist, ultimately leading to better oral health care outcomes and a better overall quality of life for their child (Bossù et al., 2020; Prekash et al., 2021). This study demonstrates promise in terms of filling the void of parent

interventions for dental anxiety in children with autism, both empowering parents and making their children more comfortable during anxiety-provoking dental exams.

Strengths, Limitations, and Future Directions

The strengths of this study include the fact that it is the first study to evaluate a parent- implemented intervention for the treatment of dental anxiety in children with autism (Nevill et al., 2016). The parent training and psychoeducation portion was reported to be successful and helpful, as per parent report. This is important due to the lack of confidence and knowledge parents report when faced with the oral health care of their autistic children (Parry et al., 2021). When parents feel empowered and understand what procedures work well for their children, they are better advocates in the actual dentist's office. Not only did the parent (Nina) rate that her confidence and knowledge increased, but she also rated the social validity to be high; Nina felt that the positive outcomes were worth the time and effort she put forth during the study. This is vital information, as it increases the likelihood that participants will follow through with treatment and, in turn, that their children will benefit. In this case specifically, the stakes are particularly high, as the direct benefit is oral health, which is strongly linked to quality of life and overall wellbeing. Assessing the social validity of the intervention is a strength of the present study because assessment of social validity is often lacking in single-case design research (Wellons et al., 2023). This study is also the first to evaluate the effect of providing opportunities for choice-making on a child's anxiety during a dental exam, although choice-making was examined as part of a multi-component intervention package instead of in isolation.

Further, the present study was high in ecological validity in that a natural

intervention agent (i.e., the parent) implemented the intervention in a naturalistic setting (i.e., the home, in which the dental environment was recreated/simulated) (Carr et al., 1999). An advantage of utilizing the parent as the intervention agent is the opportunity for frequent practice/trials (i.e., exposures) on a daily basis or as often as the parent is able. If the dentist or dental hygienist or researcher or behavior specialist was the person implementing the intervention, they would only be accessible for a few hours per week (if that); the child would then have limited access to the feared stimulus and less opportunity to navigate through the anxiety-provoking situation.

The use of both noncontingent reinforcement (i.e., in the context of counterconditioning) and contingent reinforcement allowed for the intervention to be highly individualized for Dominick and had the ability to be adapted based on his preferred interests at the time. Another strength of the study was that the intervention agent (Nina) was present at the dental visit, as were all noncontingent and contingent reinforcers. During the parent training, feedback was immediate, and the researcher was available for modeling as well as repetition as often as necessary. In doing so, it allowed for individualization of the intervention for the parent as well as the child. Because the mother was trained in intervention procedures, she practiced with Dominick on a daily basis until his actual dental exam at the dentist's office. For generalization, the dentist's office was arranged to be as closely re-created as possible to the mock dental environment at home.

Although the present study had many strengths, it is not without limitations. The primary limitation of this study was the use of an AB design, which involves threats to internal validity (e.g., lack of control for maturational effects) and is therefore considered a pre-experimental or quasi-experimental design. As such, it is not possible to definitively

establish that the findings of this study are a direct result of the intervention components alone (i.e., it is not possible to definitively establish a functional relationship between the intervention and the outcomes) as opposed to just the passage of time, history, maturation, etc. However, studies have demonstrated that dental anxiety is a persistent fear that does not resolve on its own, as it is typically negatively reinforced through avoidance (Yon et al., 2020). Therefore, it is unlikely that the participant's dental anxiety would have dissipated on its own without any form of treatment. Future research could examine which component is most effective by utilizing a changing criterion design.

Another limitation of this study was that it only included one participant, which limits external validity. Future studies should attempt to replicate findings of this study using a larger sample and a more rigorous experimental design such as a single-subject experimental design (e.g., multiple baseline across participants design) or a group design. The addition of a maintenance phase would also be useful in helping us to understand whether intervention effects are maintained over time. There are a variety of threats to both internal validity (i.e., maturation) and external validity (i.e., sampling bias) in an AB design as well. It is important to acknowledge the vast diversity of the autism spectrum and that this specific participant is not representative of all autistic children.

An additional limitation of the study was the use of rating scales that require subjective scoring. These scales included the Venham Anxiety Rating Scale, Venham Anxiety and Behavior Rating Scale, and the parent rating scale. Future studies should develop rating scales of anxiety and behavior in children displaying anxiety specifically during dental exams and attempt to make the behavioral descriptions of the different numerical ratings in these scales as objective/observable as possible.

Finally, recent studies have demonstrated that there is no significant difference between parent-mediated interventions delivered in-person as compared to those delivered via telehealth for children with autism (Hao et al., 2020). Therefore, it would be helpful for future studies that treat dental anxiety in children with autism to have therapists deliver this intervention to parents online via teletherapy and assess the parent's treatment fidelity as well as the intervention's effect on child dental anxiety. Delivering this intervention in a telehealth modality could increase the opportunity for more widespread access and use.

When individualizing treatment, parent time must be accounted for, and the treatment adjusted accordingly. This parent required on training session lasting approximately two hours. However, another parent may require multiple training sessions for longer or shorter periods of time. Not only must the parent's time be accounted for, but also the child's level of intellectual functioning. Future research should examine how to modify the intervention to be successful for those with intellectual disabilities and/or language impairment. Lastly, the treatment should aim to target a typical dental visit of the child. If that includes a cleaning, a task analysis should be created and individualized for the needs of that specific child.

Implications for the Profession of School Psychology

Results from this study inform the way that school-based professionals work with children with autism and their families. It is possible for this intervention to be delivered in the form of parent training prescribed on a child's Individualized Education Plan (IEP). The school-based clinician can effectively communicate the behavior principals and various intervention components of this study to the parent(s) first, as the psychoeducation portion could come before in-home training. Then, the subsequent parent training

session(s) could occur in the home so that the professional is available for immediate feedback in the moment. School psychologists and board-certified behavior analysts (BCBAs) who have a strong behavioral background should be familiar with all intervention components and be qualified to implement a behavior-based program (Behavior Analyst Certification Board [BACB], 2020; National Association of School Psychologists [NASP], 2020). They should also be well-versed in taking data during treatments to determine whether a treatment is deemed effective for a student and, therefore, can monitor and identify necessary changes in a process known as data-based decision making (BACB, 2020; NASP, 2020). Once the parent is trained and the professional observes that they are able to properly implement the intervention independently, the parent may need occasional check-ins, but the goal of the intervention is to have the parent be completely independent and confident in implementation.

CONCLUSION

Appropriate oral healthcare continues to be one of the largest unmet healthcare needs for children with autism (Leiva-García et al., 2019). This is largely a result of the presence of significant dental anxiety in 68% of this population (Park et al., 2022). Findings of this study demonstrate the effectiveness of a parent-mediated intervention for a child with autism experiencing dental anxiety. Improvements were seen in the percent of steps the child completed during a dental exam, the child's level of anxiety, the child's cooperation, and the parent's confidence and satisfaction with the intervention. Further, the data supports the social validity of the intervention and generalization of the intervention from a mock dental exam at home to a real-life dental exam at the dentist's office. This study shows promise for parent-mediated interventions to treat dental anxiety in the future. It also adds to the scarce literature addressing non-invasive, preventative strategies to address dental anxiety in children with autism while maintaining the dignity of the child.

Figure 1

Percent of steps completed in dental exam hierarchy during each phase

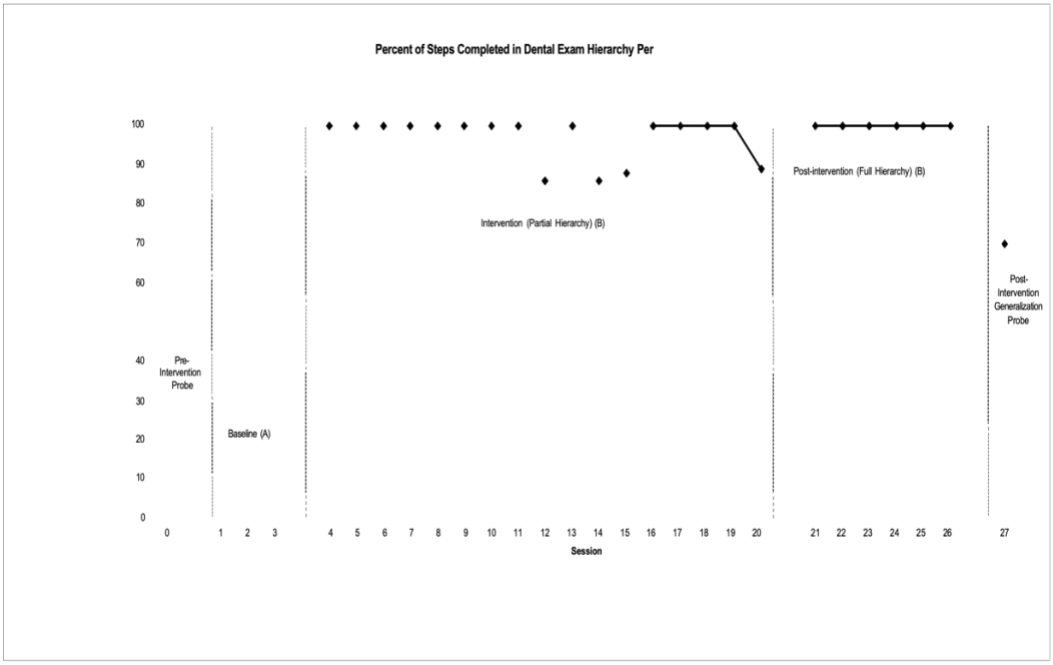


Figure 2

Anxiety during dental exam: Venham Anxiety rating scale scores across phases

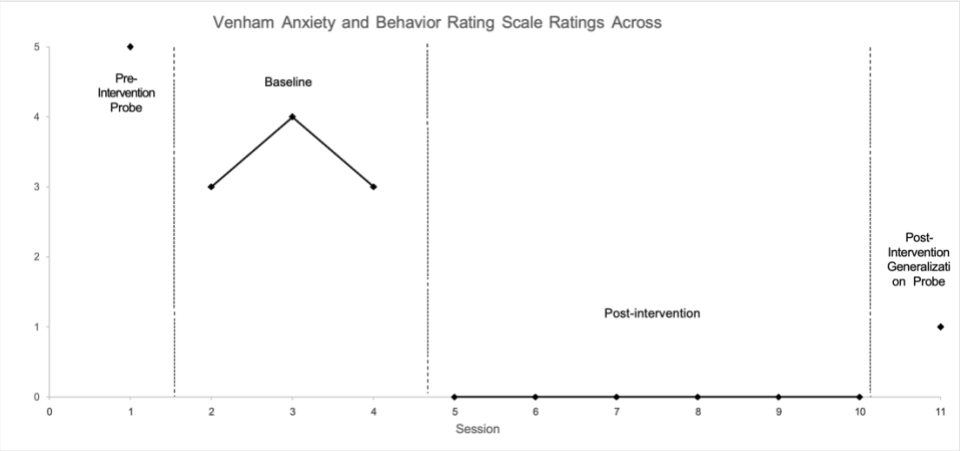
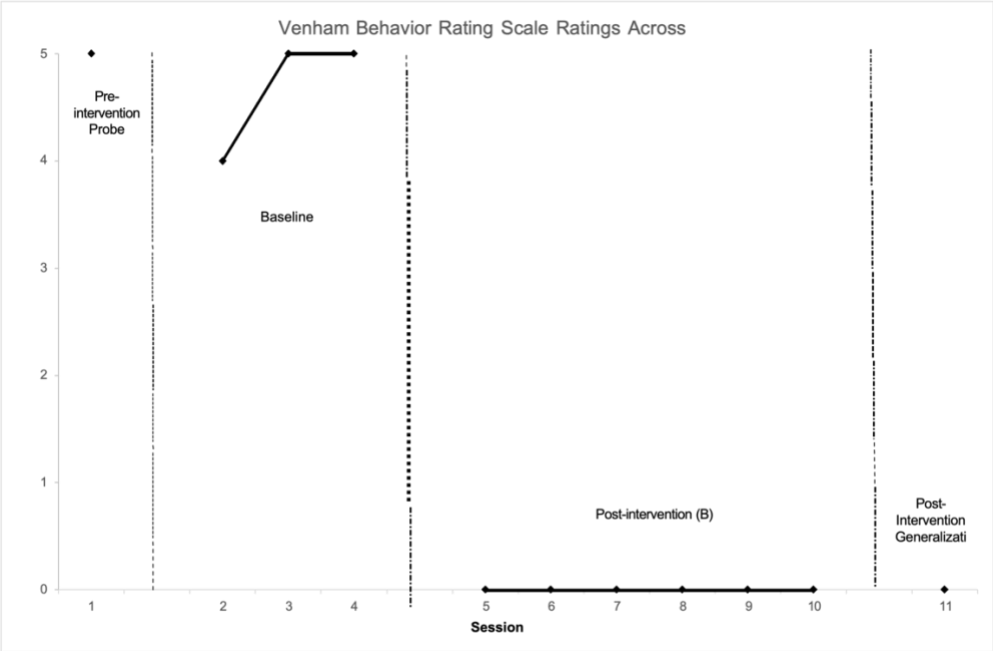


Figure 3

Compliance during dental exam: Venham Behavior rating scale scores across phases



APPENDIX A

Consent Form

Consent Form

Project Title: Say "Ah," Not "AHHH!" – Parent Intervention for the Reduction of Dental Anxiety in Children with Autism Spectrum Disorder

Principal Investigator: Alexandra Vernice, M.S., St. John's University
Supervisor: Lauren Moskowitz, Ph.D., St. John's University

Purpose: You have been invited to participate in a research study to learn about the effectiveness of a parent training program for parents of children with autism who experience dental fear. This study will be conducted by Alexandra Vernice, M.S. (Principal Investigator), Department of Psychology, St. John's University, as part of her doctoral dissertation. Alexandra Vernice's faculty sponsor is Dr. Lauren Moskowitz, Ph.D., Department of Psychology, St. John's University.

You are eligible to participate in this study if you are (a) the parent of a child with autism spectrum disorder who is (b) between 4 and 8 years of age and (c) exhibits severe anxiety/fear during routine dental exams, which may or may not result in challenging behavior (e.g., aggression, self- injury, tantrums, destructive or disruptive behavior).

Procedure: If you agree to be in this study, you will be asked to respond to a series of screening questions that ask about your child, their experience at the dentist's office, and their language abilities. Completing these screening questionnaires will take approximately 15 minutes. Your responses to these questions, any personal information, and your identity will remain confidential at all times.

If you are selected to participate in the individual parent-training program, you and your child will then participate in a pre-intervention observation ("probe") which will occur at your child's dental provider's office. The dentist should not alter their behavior in any way during this observation.

Once your child has completed the probe and a fear of the dentist is confirmed at the dental visit ("probe"), they will participate in either 3, 4, or 5 sessions so that enough data is obtained to establish a "baseline" (i.e., pre-intervention) level of their skills. These sessions will be conducted in person at your home by the principal investigator. After the parent training sessions are complete, you will implement treatment. These sessions will be observed in-person by the principal investigator and recorded via a hand-held recording device. Throughout the course of the intervention phase, you will rate the severity of your child's anxiety via an internet-based survey platform immediately following each session.

Finally, your child will be observed during a dental visit following the intervention phase to determine whether skills they learned during the translate to their actual dentist's office ("generalization"). This session will be observed in-person by the principal investigator and recorded via a hand-held device.

By participating in this study, you consent to you and your child being recorded for research purposes. This includes both recordings of your child's challenging behavior and anxiety during a dental exam as well as recordings of the intervention sessions.

Potential Benefits: By participating in the present research study, you may benefit by increasing your knowledge of your child's anxiety and challenging behaviors and empirically supported strategies for addressing anxiety. The parent training program also may benefit you by helping you to reduce your child's anxiety, challenging behaviors, and improve your family's quality of life. Finally, the information gained from this study will also contribute to the research literature on the design of interventions that can improve anxiety for children with autism during dental visits and improve family quality of life. At the conclusion of the study, you will receive a $50 Amazon gift card. If you withdraw prior to the conclusion of the study, you will be compensated with a $20 Amazon gift card.
Cost to You: You will not have to pay anything to participate in this study. The parent training program is free-of-charge.

Potential Risks/Discomforts: There are no known risks associated with participating in this study. Possible risks may include any discomfort you may feel when discussing your child's anxiety/challenging behaviors or responding to personal questions about your thoughts and feelings, as well as any fatigue or annoyance you may feel when completing questionnaires or learning/implementing intervention techniques.
Confidentiality: Confidentiality is important to us. Your research records will be strictly maintained both during the screening and throughout this study in the following ways:

1. Your name will not be connected to your results or to your responses on the questionnaires. Instead, a number will be used for identification purposes during the screening process. Information that would make it possible to identify you or any other participant will only be accessible to the principal investigator (Alexandra Vernice), her faculty sponsor (Dr. Lauren Moskowitz), and Dr. Moskowitz's research assistants.

2. If you are selected to participate, you will be contacted via telephone by the principal investigator.

3. All pre-intervention, intervention, and post-intervention observations of your child and yourself will be recorded for quality assurance. Recordings will only be accessible to the principal investigator, her faculty sponsor, and approved research assistants. You may request a copy of your recorded sessions or the recorded observations at any time.

Your confidentiality will be maintained at all times. However, if you tell us you are going to hurt yourself, hurt someone else, or if we believe the safety of a child is at risk, we will have to report this. In a lawsuit, a judge can make us give him or her the information we collected about you.

Your participation in this study is entirely voluntary and you may withdraw from participation at any point without penalty and without any effect on your present or future relationship with St. John's University. You may refuse to answer any questions with which you are uncomfortable. You or yo your child may also stop at any time and ask the principal investigator any questions

you have.

Your agreement or lack of agreement to participate in this study will in no way affect your ability to seek future services from St. John's University.

If there is anything about the study or your participation that in unclear or that you do not understand, if you have any questions or wish to report a research-related problem, you may contact Ms. Alexandra Vernice, M.S., at Alexandra.Vernice10@my.stjohns.edu or the faculty sponsor, Dr. Lauren Moskowitz, Ph.D., at (718) 990-6418 or via email at moskowil@stjohns.edu. For questions about your rights as a research participant, you may contact the St. John's University Human Subjects Review Board at (718) 990 -1440.

Statement of Consent:

I have read the above information. I have asked any questions that I had regarding this study and they have been answered to my satisfaction. I consent to participate in the present study.

Name of Participant: Date:

Signature of Participant: _____

Regarding the use of video-recordings, please check one of the following options:

I give permission for the video-recordings to be used in professional presentations. I understand that neither my child nor I will receive compensation for the making or presentation of these recordings.

I would consider giving permission for the video-recordings to be used in professional presentations, but I need to know more about how you would use them.

I give permission for the video-recordings to be used by project staff only (Ms. Vernice, Dr. Moskowitz, and trainees in her labs) and NOT used for professional presentations.

APPENDIX B

Demographic Questionnaire

Please answer the following questions about yourself.

Your Age: _____

Your Sex (please circle):

Male
Female
Other

You are currently (please circle):

Married
Widowed
Divorced
Separated
Never married
Living with partner
Your relationship to your child:
Biological parent
Adoptive parent
Foster parent
Other adult relative

Please circle one or more categories below to indicate what race(s) you consider yourself to be:

White
Black or African American
Indian or Alaska Native Asian
Native Hawaiian or Pacific Islander
Other

Are you of Spanish, Hispanic, or Latino descent?
Yes
No

Highest education level:
Some High School
High School Diploma or Equivalent (GED)
Some college
Technical/Vocational School
Associate's Degree
Bachelor's degree
Post-college graduate (e.g. Master's, Specialist, Doctoral, etc.)

Employment status:

Part time
Full time
Unemployed
Homemaker
Student
Retired
Unable to work

Which of the following explains your past and current experience with parent training (please check one)?

I have never received parent training.
I currently attend group parent training at my child's school or a local clinic.
I currently receive parenting training as part of my child's IEP or IFSP.
I have received parent training in the past but do not receive parent training now. How

long has it been since you received parent training last?

Demographic Questionnaire: For Child

Please answer the following questions about your child with autism.

Child's Age:

Child's Sex:

Male
Female
Other

Please check one or more categories below to indicate what race(s) you consider your child to be:

American Indian or Alaskan Native Asian
Black or African-American
Native Hawaiian/Pacific Islander White

Is your child of Spanish, Hispanic, or Latino descent?
Yes
No

How much does your child understand spoken language?

Able to understand very little spoken language
Able to understand some basic language and simple instructions in familiar contexts
Able to understand most basic instructions and questions
Able to understand most routine every day language
Able to understand complex language about a wide range of topics

How much does your child use spoken language to communicate?
Able to use very little meaningful speech
Able to communicate basic needs and wants
Able to communicate needs, wants, and some ideas
Able to communicate about a limited range of topics in a meaningful way
Able to communicate about a wide variety of topics in a meaningful way

What level of support does your child require for completing activities of daily living (e.g. toileting, dressing, eating, etc.)?

Requires support for almost all activities of daily living
Requires support for most, but not all, activities of daily living
Requires support for some activities of daily living
Requires support for only a few activities of daily living
Does not require support

What are your child's neurological and/or psychological diagnoses? (Please select all that apply):
Anxiety Attention-Deficit/Hyperactivity Disorder (ADHD)
Autism Spectrum Disorder
Conduct Disorder Depression Intellectual Disability Learning Disability
Obsessive-Compulsive Disorder Oppositional Defiant Disorder (ODD) Post-traumatic Stress Disorder (PTSD) Tourette Syndrome
Other

Does your child presently or has your child ever received any other treatment to address his or her dental anxiety? If so, when? And what was the nature of the treatment?

What is your child's school placement?

Public school
Private school for children with disabilities
Other Private School
Parochial School
Homeschool
Other

What is your child's current grade in school?

Please describe your child's last dental visit, including:

Date: _____

Type of Visit (6 month visit, specialized procedure, etc.):

Were any methods used to gain compliance during the exam (i.e., restraint, anesthesia, videos, etc.)

Does this child have a behavior intervention plan (BIP) or a behavior support plan (BSP) at school?

Yes
No
I'm not sure
Other

What medication(s), if any, has your child been prescribed over the past 6 months and how long has he or she been taking each medication?

Adapted from (Moskowitz, 2021)

APPENDIX C

Parent Pre-Intervention Questionnaire

1. If you were given strategies to make dental visits more tolerable for your child, how confident are you that you could implement the strategies with little to no support?

1	2	4	5
Not at all confident	Somewhat confident	Confident	Very Confident

Please rate your knowledge in the following areas:

2. How familiar are you with systematic desensitization?

1	2	4	5
Not at all familiar	Somewhat familiar	Familiar	Very Familiar

3. How familiar are you with positive reinforcement?

1	2	4	5
Not at all familiar	Somewhat familiar	Familiar	Very Familiar

4. How familiar are you with in-vivo modeling?

1	2	4	5
Not at all familiar	Somewhat familiar	Familiar	Very Familiar

Please rate your comfortability with the following:

1. Systematic desensitization

1	2	4	5
Not at all comfortable	Somewhat comfortable	Comfortable	Very Comfortable

2. Positive reinforcement

1	2	4	5
Not at all comfortable	Somewhat comfortable	Comfortable	Very Comfortable

3. In-vivo modeling

1	2	4	5
Not at all comfortable	Somewhat comfortable	Comfortable	Very Comfortable

4. At this time, how comfortable are you taking your child to a dental visit?

1	2	4	5
Not at all comfortable	Somewhat comfortable	Comfortable	Very Comfortable

5. How likely are you to schedule and attend a routine dental visit for your child?

1	2	4	5
Not at all likely	Somewhat likely	Likely	Very likely

6. What is the current level of support your child needs during their dental visit?

0	1	2	3	4
No support necessary	Some support (i.e., holds a stuffed animal, parent's hand)	Support (i.e., continuous verbal prompting, restraint at times)	Physical restraint for the entirety of the visit	Child goes under anesthesia/use of gas

APPENDIX D

Post-Intervention Parent Questionnaire

1. I have a greater understanding of behavior principles such as modeling, reinforcement, and systematic desensitization.

1	2	3	4	5
Strongly Disagree	Disagree Somewhat	Neutral	Agree Somewhat	Strongly Agree

2. The intervention taught during the parent training portion was helpful.

1	2	3	4	5
Strongly Disagree	Disagree Somewhat	Neutral	Agree Somewhat	Strongly Agree

3. The intervention components were simple to learn.

1	2	3	4	5
Strongly Disagree	Disagree Somewhat	Neutral	Agree Somewhat	Strongly Agree

4. I feel better equipped to prepare my child for dental visits.

1	2	3	4	5
Strongly Disagree	Disagree Somewhat	Neutral	Agree Somewhat	Strongly Agree

5. I feel more comfortable taking my child for future dental appointments.

1	2	3	4	5
Strongly Disagree	Disagree Somewhat	Neutral	Agree Somewhat	Strongly Agree

6. Bringing my child to the dentist seems less anxiety provoking for them than before the intervention.

1	2	3	4	5
Strongly Disagree	Disagree Somewhat	Neutral	Agree Somewhat	Strongly Agree

7. My child's quality of life has improved after the study.

1	2	3	4	5
Strongly Disagree	Disagree Somewhat	Neutral	Agree Somewhat	Strongly Agree

8. Learning and implementing the strategies was time-consuming.

1	2	3	4	5
Strongly Disagree	Disagree Somewhat	Neutral	Agree Somewhat	Strongly Agree

9. Learning and implementing the strategies was effortful.

1	2	3	4	5
Strongly Disagree	Disagree Somewhat	Neutral	Agree Somewhat	Strongly Agree

10. Participating in this study was worth the time and effort that I was able to put into it.

1	2	3	4	5
Strongly Disagree	Disagree Somewhat	Neutral	Agree Somewhat	Strongly Agree

APPENDIX E

Assent Form

Hi! My name is Alex and I work with kids who do not like the dentist. I am trying to help you so the dentist won't be as scary any more. I would like to watch you at your dental visit. I would like to watch you today, and a few more times after that. If it's ok, I am going to make a movie of you and (parent) practicing at your house so that I can watch it later. If you say "yes," you or your (parent) can still stop at any time by saying "I want to stop." No one will get in trouble if they want to stop.

Is it ok if I watch you at the dentist today?

If no, discontinue.
If yes,

"Ok, thank you." "Great, thank you."

Questions: If you have any questions about the study or want to talk about the study, you can contact the principal investigator, Ms. Alexandra Vernice, M.S., at (516) 680-2753 or alexandra.vernice10@my.stjohns.edu or the faculty sponsor, Dr. Lauren Moskowitz, Ph.D. at (718) 990-6418 or via email at moskowil@stjohns.edu.

Name of Participant: Date:

(please print) Signature of Participant or Witness:

APPENDIX F

Dental Exam Hierarchy

10 Steps in the Dental Exam Hierarchy:

1. Child enters the room
2. Child sits in dental chair
3. Child sits back in dental chair
4. Child lies back in dental chair
5. Child tolerates wearing dental bib
6. Child tolerates dental light.
7. Child tolerates touch of glove to face and fingers on lips.
8. Child opens mouth when asked “say ahhh”
9. Child keeps an open mouth for and tolerates mirror for 10s
10. Child keeps an open mouth for and tolerates explorer for 10s

APPENDIX G

Treatment Components – Treatment Integrity Checklist

Check if observed:	Treatment Component	Description
☐	Noncontingent reinforcement (i.e., counter-conditioning)	Child is provided with their preferred ("anti-anxiety") stimulus or stimuli at the start of the hierarchy; this anti-anxiety stimulus (or stimuli) is paired with the anxiety-provoking stimulus (the dental exam).
☐	Modeling of subsequent step	The parent models the next step of the hierarchy with a stuffed animal (on theme with the child's interest, if possible).
☐	Gradual Exposure	Child is gradually exposed to each step of the dental hierarchy (step by step).
☐	Contingent reinforcement	Child is provided reinforcement with a highly preferred item or activity (different than their noncontingent reinforcer) after the successful trial of the current step.
☐	Choice	Child is provided with an option as to the next step to be completed (for steps 5 and 9)

APPENDIX H

Venham Anxiety and Behavior Rating Scale

Rating	Definition (behavioral rating scale)
0	Relaxed, smiling, willing, and able to converse
1	Uneasy, concerned. During stressful procedure may protest briefly and quietly to indicate discomfort. Hands remain down or partially raised to signal discomfort. Child willing and able to interpret experience as requested. Tense facial expression, may have tears in eyes
2	Child appears scared. Tone of voice, questions and answers reflect anxiety. During stressful procedure, verbal protest, (quiet) crying, hands tense and raised, (not interfering much may touch dentist's hand or instrument, but not pull at it). Child interprets situation with reasonable accuracy and continues to work to cope with his/her anxiety
3	Shows reluctance to enter situation, difficulty in correctly assessing situational threat. Pronounced verbal protest, crying. Using hands to try to stop procedure. Protest out of proportion to threat. Copes with situation with great reluctance
4	Anxiety interferes with ability to assess situation. General crying not related to treatment. More prominent body movement. Child can be reached through verbal communication, and eventually with reluctance and great effort he or she begins the work of coping with the threat
5	Child out of contact with the reality of the threat. General loud crying, unable to listen to verbal communication, makes no effort to cope with threat. Actively involved in escape behavior. Physical restraint required

APPENDIX I

Venham Behavior Rating Scale

Rating	Definition (behavioral rating scale)
0	Total cooperation, best possible working conditions, no crying or physical protest
1	Mild, soft verbal protest or (quite) crying as a signal of discomfort but does not obstruct progress. Appropriate behavior for procedure
2	Protest more prominent. Both crying and hand signals. May move head around making it hard to administer treatment. Protest more distracting and troublesome. However, child still complies with request to cooperate
3	Protest presents real problem to dentist. Complies with demands reluctantly, requiring extra effort by dentist. Body movement
4	Protest disrupts procedure, requires that all of the dentist attention be directed toward the child behavior. Compliance eventually achieved after considerable effort by dentist, but without much actual physical restraints. More prominent body movement
5	General protest, no compliance or cooperation. Physical restraint is required

APPENDIX J

Recruitment Flyer

Free Intervention Study!

Are you a parent of a child with autism?

Would you like free parent training to help manage your child's fear/anxiety at the dentist?

Alexandra Vernice, a doctoral student from St. John's University, is conducting a research study on the effectiveness of a parent training program for parents of children with autism to teach their children to help overcome dental fears or phobias. She is currently seeking children and parents to volunteer to participate in this study.

This study might be right for you if…

- You are a parent of a child who has been diagnosed with **Autism Spectrum Disorder** (autism) between the ages of **4 and 8 years old**.
- Your child has **fear/anxiety of the dentist.**
- You are willing to **participate in parent training sessions** in your home and dental visits with your child.
- You and your child live in the **same home.**
- Your child is **not receiving** any other dental anxiety-reducing treatment during the study.

The potential benefits of the study are…

- You may increase your knowledge of evidence-based strategies for addressing anxiety and helping your child to be able to cope with fear-inducing situations during dental visits.

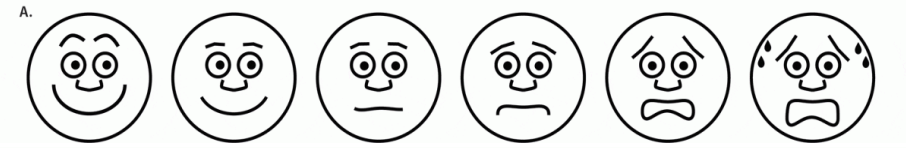
For more information on this study or to sign-up to participate, please contact the principal investigator, Alexandra Vernice, at (516) 437-5026 or via email at Alexandra.Vernice10@my.stjohns.edu.

Thank you!

APPENDIX K

Child Anxiety Rating Scale for Parents

A.



[a]For the Anxiety Rating Scale and the Anger Rating Scale,

APPENDIX L

Sample of the parent hierarchy datasheets

Current Step: #5 -
CHOICE STEP - BIB or LIGHT.

"It's time for the dentist, come on in! Remember, you're working for *reinforcer*!"

Trial 1: Did he enter the room? Yes No

Trial 1: Did he sit on the chair? Yes No

Trial 1: Did he sit back on the chair? Yes No

Trial 1: Did he tolerate the chair reclining? Yes No

ASK: "What do you want next, put on the bib or turn on the light?"

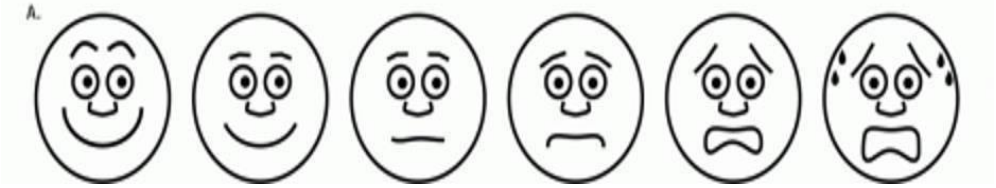
Did he make a choice? Yes No

Model dinosaur doing chosen step.

Trial 1: Did he tolerate the chosen step (bib/light)? Yes No

***If yes: "Nice job** *putting on bib/turning on the light**, **you can have *reinforcer!**"*

Circle the face that shows how much anxiety you think Neel felt during this step.



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