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Evaluation of Effects of Behavioral Skills Training in Promoting Three Social Skills in Young Child With Autism: A Multiple Probe Research Design Study

by
Jennifer Rey

An Applied Dissertation Submitted to the
Abraham S. Fischler College of Education
and School of Criminal Justice in Partial
Fulfillment of the Requirements for the
Degree of Doctor of Education

Nova Southeastern University
2024

Approval Page

This applied dissertation was submitted by Jennifer Rey under the direction of the persons listed below. It was submitted to the Abraham S. Fischler College of Education and School of Criminal Justice and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Nova Southeastern University.

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Statement of Original Work

I declare the following:

I have read the Code of Student Conduct and Academic Responsibility as described in the *Student Handbook* of Nova Southeastern University. This applied dissertation represents my original work, except where I have acknowledged the ideas, words, or material of other authors.

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Abstract

Evaluation of Effects of Behavioral Skills Training in Promoting Three Social Skills in Young Child With Autism: A Multiple Probe Research Design Study [Jennifer Rey, 2024]: Applied Dissertation, Nova Southeastern University, Abraham S. Fischler College of Education and School of Criminal Justice. Keywords: applied behavior analysis, autism, social skills, behavioral skills training

This applied dissertation was designed to evaluate the effectiveness of the behavioral skills training model in teaching one 4-year-old child with autism to greet others, use an appropriate tone of voice, and use anger control. Moreover, this study assessed the maintenance of newly acquired social skills relying on a multiple probe research design. It was hypothesized that with the use of behavioral skills training the acquisition of the appropriate social skills at an early age would allow the child to engage with peers and adults in the training environment and later in a variety of social situations across other settings and individuals.

The researcher developed the task analysis procedures to teach the three social skills and implemented the procedures with the use of the behavioral skills training model. The trained implementer applied instruction, modeling, role-playing, feedback, and reinforcement components of the behavioral skills training to teach the target skills. To ascertain the overall deficits in social skills, the researcher administered the pre-post Social Responsiveness Scale. Parents of the participant completed a social validity survey to express a perceived level of satisfaction with the intervention.

An analysis of the collected data revealed that behavioral skills training model was an effective approach to teaching the target social skills to a young child with autism while the participant's T score demonstrated only marginal changes in the overall social skill acquisition. The social validity results of the study further promote the effectiveness of intervention as a positive approach for young children with ASD.

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Chapter 1: Introduction

Healthcare practitioners, special educators, and applied behavior analysts unanimously call for implementation of an effective early intervention programming for young children with autism. The Individuals with Disabilities Education Act of 2004 also mandates the use of the evidence-based early intervention approaches for children with various disabilities to include autism. Early intervention plays a crucial role in the child's development because it may directly or indirectly involve and build upon the concept of brain plasticity, which promotes long-lasting effects relative to the behavioral, cognitive, and affective skill advancement in young children (Dawson et al. 2010). Children and adolescents with ASD experience various difficulties with the social communication and interaction (Radley et al., 2017; Ryan et al., 2019). Relying on a single-subject research methodology, the researcher investigated the use of a behavioral skills training model for teaching social skills to one young child with autism and, hence, contributed to the literature on the topic of early intervention strategies for children with autism.

Statement of the Problem

According to the Centers for Disease Control and Prevention ([CDC], 2023), about one in 36 children have been diagnosed with autism spectrum disorder (ASD) across all racial, ethnic, and socioeconomic groups. ASD is a developmental disability that is characterized by various degrees of deficits in social communication, interaction, and restricted or repetitive behaviors or interests (American Psychiatric Association [APA], DSM-5, 2013, p. 12). The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), defines ASD as a neurodevelopmental disorder with restricted, repetitive patterns of behavior, interests, or activities, as exhibited by at least two areas

that may include repetitive behaviors, insistence on routine, fixed interests, and high sensory susceptibility (APA, 2013, p. 13). Because of difficulties in the social communication and interaction domain of ASD, children and adolescents with ASD often experience various challenges with the concept of friendship and social norms that may include initiation and maintenance of intimate relationships as well as appropriate relationships with same-age peers (Radley et al., 2017; Ryan et al., 2019). According to the Theory of Mind, which is grounded in cognitive sciences that investigates the mental states of individuals from an outlooker's point of view, children with ASD cannot anticipate and explain the behavior and mental state of others (Baron-Cohen et al., 1985; de Veld et al., 2020). Perceptions of friendship among children with ASD do not form naturally and require effective intervention strategies (Ryan et al., 2019; Radley et al., 2017). There are numerous social skills training (SST) approaches and programs that emerged as part of cognitive-behavioral therapy (CBT) and the science of applied behavior analysis ([ABA]; Beaumont et al., 2015; Murphy et al., 2018; Nuernberger et al., 2013; Peters & Thompson, 2015; Radley et al., 2017; Ryan et al., 2019; Spence, 2003; Yun et al., 2017). The Superheroes Social Skills Training (Radley et al., 2017; Murphy et al., 2018), robots (Yun et al., 2017), the Secret Agent Society ([SAS], Beaumont et al., 2015), and Behavioral Skills Training ([BST], Nuernberger et al., 2013; Ryan et al., 2019) are among a few successful social skills interventions for children ages 7–12. However, SST programs for young children, ages 4–8, have yet to receive attention from practitioners and researchers. The lack of early intervention social skills strategies negatively affects young children with ASD. According to Wimmer and Perner (1983), mentalistic cognitive abilities begin to develop in the first 3–4 years of life. Early

intervention strategies for young children with ASD are recommended by practitioners (Zwaigenbaum et al., 2015) and mandated through the Individuals with Disabilities Education Act (2004). According to Dawson et al. (2010), early intervention focuses on the crucial developmental points because healthy early-age development is associated with brain plasticity. Brain plasticity promotes long-lasting effects on acquisition of social competencies and behavioral, cognitive, and affective skills to interact in diverse social contexts (Spence, 2003; White et al., 2006). A single-subject research study that investigates the use of a BST model to teach SST to young children could help with the acquisition of social competencies and contribute to the literature on the topic of early intervention strategies for children with ASD.

The Research Problem

Various SST programs had already demonstrated successful outcomes for children with ASD: Superheroes Social Skills Training (Murphy et al., 2018; Radley et al., 2017), robots (Yun et al., 2017), SAS (Beaumont et al., 2015), and BST (Nuernberger et al., 2013; Ryan et al., 2019). These programs targeted SST for children above age 7 (Nuernberger et al., 2013; Peters and Thompson, 2015; Ryan et al., 2019). Nuernberger et al. (2013) examined a BST model inclusive of role-playing, in-situ training, and reinforcement components to teach vocal and non-vocal conversation skills to young adults with ASD. As a result of the study, Nuernberger et al. determined that BST was effective in teaching three young adults with ASD vocal and non-vocal conversation skills. Meanwhile, Ryan et al. (2019) furthered the research on BST by conducting a study to determine if BST can be used to increase appropriate conversation interactions for six adults with ASD using a multiple probe design across participants. They

implemented an instructional component of BST that addressed conversation skills, modeling, practicing conversations, and delivering immediate feedback relative to the conversation performance in a small group setting. This study demonstrated that BST increased appropriate interactions among adults with ASD when small group instructions, peer observation during practice, and feedback sessions of BST. Although Peters and Thompson (2015) examined the use of BST to teach social skills to children with ASD, their participants' age ranged from 4 to 9 years. This is one of the few studies that effectively used BST to teach younger children with ASD social skills.

There is a gap in the literature when it comes to the implementation of BST to teach younger children with ASD ages 4–8. The study aimed to further the research using BST for this age group.

Background and Justification

An effective social skill training may include a wide variety of intervention strategies that rely on environmental modifications, social narratives, adult prompting and rehearsal, peer-mediated modeling, and interventions (Murphy et al., 2018). Spence (2003) identified instructions, discussions, modeling, role-playing, behavior rehearsal, feedback, and reinforcement along with social perception skills training, self-instruction, self-regulation techniques, social problem solving, and reduction of inappropriate social responses as several components of a potential social skill programming. According to Murphy et al. (2018), effective and efficient implementation of the social skill training components and strategies should be grounded in the best available scientific evidence. It is an area of practical concern. Peters and Thompson (2015) successfully implemented a BST training package using role-playing, in-situ training, rehearsal, feedback, and

reinforcement to successfully teach SST to young children with ASD. Their BST training package effectively demonstrated that all six participants increased their skills in posing questions to an uninterested listener and changing topics, all of which were maintained over time and follow-up phase. Several other studies (Nuernberger et al.,2013; Ryan et al., 2019) used components of BST to successfully teach social skills to adults. This further supports the use of BST for teaching social skills to wide audience.

Deficiencies in the Evidence

BST has been studied by many researchers and involves the use of instruction, modeling, rehearsal, and feedback (Gunn et al., 2017; Hogan et al., 2015; Miller et al., 2014; Sawyer et al., 2017). Components of BST have also been used as part of an SST approach (Hine, 2014; Spence, 2003). There is also evidence that training in social perception, self-instruction and regulation techniques, social problem solving, and the reduction of competing inappropriate social responses can aid in SST (de Veld et al., 2020; Spence, 2003). Although BST has been demonstrated effective in teaching social skills, it is important to determine if a BST package can be an effective evidence-based method for teaching social skills to young children with ASD.

Audience

This study was designated for parents, practitioners, and educators who are involved in the implementation of SST for children with ASD. The outcome of this study will inform administrators of early childhood and special education programs as well as researchers on the best evidence-based practices that are designed to teach social skills for children with ASD.

Setting of the Study

The setting of this study was a therapeutic learning center for young children with ASD and other developmental disabilities ages 1.5 through 10. The learning center is a small private elementary school, with 15–20 students, in South Florida.

Researcher's Role

The primary researcher is a board-certified behavior analyst (BCBA) with over 2 years of professional experience currently serving as a director of the learning center where the study was implemented. In this capacity, she provides supervision to a team of registered behavior technicians (RBTs) and board-certified assistant behavior analysts (BCaBAs) delivering direct services to young children. She develops and oversees the implementation of the ABA and educational programs for students ages 1.5–10 with a variety of developmental disabilities and behavior concerns.

Purpose of the Study

The purpose of this single-subject research study was to evaluate the use of BST to teach social skills to young learners with ASD ages 4–8 years. Because children with ASD exhibit various deficits in social communication and interaction with others, the concept of friendship, social norms, and many other socially appropriate behaviors require targeted intervention and effective training at an early age (Radley et al., 2017; Ryan et al., 2019). Young children with ASD who possess the prerequisite verbal skills such as mands and intraverbals in their repertoires could benefit from targeted social skills training that is structured and delivered according to the BST model. The goal of the study was to evaluate the effectiveness of BST in teaching young children with ASD, ages 4–8, to socialize with peers using age-appropriate and preselected social skills.

Moreover, this study aimed at assessing the maintenance of newly acquired social skills. It is hypothesized that with the use of BST, the acquisition of the appropriate social skills at an early age will allow children to engage with peers and adults in a variety of social situations.

Definition of Terms

Autism Spectrum Disorder is a developmental disability that is characterized by various degrees of deficits in social communication, interaction, and restricted or repetitive behaviors or interests (APA, 2013, p. 12). The DSM-5 defines ASD as a neurodevelopmental disorder with restricted, repetitive patterns of behavior, interests, or activities, as manifested by at least two areas that may include repetitive behaviors, insistence on routine, fixed interests, and high sensory susceptibility (APA, 2013, p. 13).

Applied Behavior Analysis is a science devoted to understanding and improving human behavior (Cooper et al., 2022, p. 2).

Behavioral Skills Training is a training package that includes instructions, modeling, rehearsal, and feedback components to teach new skills with a predetermined criterion (Dib & Sturmey, 1970).

Target behavior is the specific behavior of concern selected for change (Cooper et al., 2022, p. 49).

Social Skills Training is a training designed to address socially significant behaviors (Spence, 2003).

Mand is a verbal behavior in which the form of a response (words, signs, gestures, picture exchange, etc.) is under the control of the motivating operation and a history of specific reinforcement (Cooper et al., 2022, p. 416).

Tact is a verbal behavior in which the form of the response is under the functional control of a nonverbal discriminative stimulus and a history of conditioned reinforcement (Cooper et al., 2022, p. 416).

Observational Learning is differential responding based on the observed response and its corresponding consequence (McDonald & Ahearn, 2015).

Chapter 2: Literature Review

Theoretical Perspective

Social skills training programs are grounded in the social cognitive learning theory (Bandura, 1986: Bauminger-Zviely et al., 2013). This theory was originally developed by Albert Bandura in 1986. It emphasizes social-emotional development as well as approaches to modeling, consequences, observational learning, emotional reaction, and attitudes. The social cognitive theory points out that behavior, cognition, and environmental influences affect human behavior (Bandura, 1986). While Bandura relied on the science-based principles of operant conditioning, he also introduced the notion of learning from the environment through the process of observational learning (OL), which is based on the modeling component of the social cognitive learning theory. McDonald and Ahearn (2015) demonstrated that the development of OL is crucial to the acquisition of social skills for young children with ASD and occurs during early childhood. The authors successfully observed the emergence of OL on untrained tasks for five out of the six participants after training one to three OL task variations.

According to the study conducted by Bauminger-Zviely et al. (2013), improvements in the social-cognitive area were observed after teaching social skills to children with high-functioning autism (HFA). This study evaluated the effectiveness of a school-based intervention that was combined with cognitive behavioral therapy to teach social collaboration, engagement, and social conversation to 22 children with HFA. The authors utilized a Join-In program to teach collaboration and a No-Problem program to teach conversation. Measures of the socio-cognitive area encompassed concept perception, problem-solving, Theory of Mind, and a dyadic drawing and were used to

assess potential change in the participants' social engagement. Results of this study revealed improvement in the socio-cognitive area across all participants who demonstrated active participation in social solutions and conversations with peers and an appropriate understanding of collaboration. Insignificant improvements in the Theory of Mind were also observed. While the intervention proved to be effective at improving the participants' socio-cognitive area, the study also emphasized the importance of observation, modeling, and behavior imitation which are grounded in the Bandura's social cognitive learning theory and are utilized in the BST model.

Autism Spectrum Disorder

An ASD diagnosis is four times more common in boys than girls (CDC, 2022). Juergensen et al. (2018) discussed that ASD is characterized by impairments in social communication and restricted interests along with delayed language, abnormal language development, joint attention deficits, and atypical eye contact. The diagnostic characteristics of ASD could be detected as early as 18 months and lead to early intervention. For children to meet ASD diagnostic criteria according to the DSM-5, they must demonstrate impairments in two categories: social communication impairments and restricted interest (APA, 2013).

According to the study conducted by Sheldrick et al. (2019), pediatricians are not always able to monitor the emergency of ASD characteristic and diagnosis since most visits are 3-12 months apart. Once the screening is conducted, it is also up to the parent to seek the services needed for their child. Therefore, the authors set out to determine if the clinical decision encourages the referral for the next stage and to categorize the process between the early intervention (EI) provider and the parents during the screening process.

For clinicians to diagnose children with ASD it must meet the American Academy of Pediatrics (AAP) guidelines according to which the child receives a positive screening result in at least two risk factors such as having a sibling with ASD or a concern from either a provider or caregiver. A convergent mixed methods design along with quantitative analysis was implemented to analyze the value of the positive screening results, the EI provider concerns, and EI providers' perception of the parents' concerns through the evaluation of their decision rule with involvement of a shared decision-making process. The participants in the quantitative component of the study were the parents of children eligible for an ASD diagnosis between November 1, 2014, and February 14, 2018, at three EI agencies while the qualitative component involved a sub-sample of the EI providers from one of the three partner agencies. The screening process had three stages: questionnaires, observational screening by EI provider as part of routine clinical practice, and diagnostic assessment at a university clinic. Quantitative data were collected by the researcher to compare how successful was the screening in Stage 2 based on the Stage 1 results. Meanwhile, the qualitative component involved brief surveys and in-person semi-structured interviews that were developed by trained qualitative researchers for EI providers and parents. As a result, the average screening age was 23.8 months with an average age of ASD diagnosis of 27.4 months suggesting that concern was more likely to be reported for children with high screening compared to those with scores closer to the threshold. There were 33% of children from Stage 1 who were referred to Stage 2. Among 50% of children who were referred to Stage 2 had both positive screening scores and reports of concerns from a provider/parent. Based on the comparisons, the authors determined that it is both effective to diagnose children with

ASD based on a positive screening result and based on the presence of concern for ASD symptoms. The researchers concluded that along with previous research, parents' concern, providers' clinical judgment, and shared decision-making are all important factors in the detection and diagnosis of ASD.

Hudock and Esler (2022) discussed clinical recommendations and evidence-based strategies for conducting diagnostic evaluations of young children who are suspected of having ASD. Although most children who are diagnosed with ASD are between 24 and 48 months, there are ASD traits that are present within the first year and even prenatally. Repetitive behaviors may begin emerging at 12 months of age with autism-specific differences in social communication development which may be evident in the second year of life. Parent reports or direct observations of the child are among the first pre-diagnostic opportunities that usually take place between first 12-24 months of age. According to the authors, some of the more commonly used diagnostic tools available at 12 months of age are the Toddler Autism Diagnostic Interview-Revised (Toddler ADI-R), Autism Diagnostic Observation Schedule, 2_{nd} Edition (ADOS-2). The Bayley Scales of Infant and Toddler Development and the Mullen Scales of Early Learning can be used along with parent reports such as the Vineland Adaptive Behavior Scales and the Adaptive Behavior Assessment Scales – 2nd Edition (ABAS-II) can be used to assess developmental skills during the trajectory of the child with ASD.

Miller et al. (2019) discussed the difficulties of diagnosing ASD prior to age 2 due to the characteristics of ASD, such as poor peer relationship, lack of conversation skills, and restricted or stereotyped interests not being typical in infants and young toddlers, nor in individuals with low mental age (MA), below 12 MA. The study aimed

to determine the effectiveness of ADOS and CARS in the diagnosis of ASD and Global Developmental Delay (GDD) in children 2-year-old with a cognitive MA of 12 months and to explore the features that characterize children with ASD with low versus high MA and compare it to GDD. The study included 653 participants with either ASD or GDD from a large, multi-site investigation of early detection of ASD. The participants were separated into three groups based on the DSM-IV diagnostic criteria and cognitive status. The participants were selected after completing a rating scale at their pediatrician's office or early intervention for those without ASD services, and then it was followed up with a phone interview. All the diagnoses were completed by professionals based on the symptoms, observation of the child, developmental history, and scores from the ADOS, CARS, Mullen Scare of Early Learning (MSEL), and VABS. The researchers did not find evidence of collinearity between the ADOS and CARS classifications. Based on the comparative results, the researchers found that ADOS is most likely to overclassify children with low MA as being diagnosed with ASD. Meanwhile, the CARS can both under and over classified as ASD. According to the statistical results that were obtained through the application of ANOVA, the scores significantly differed from CARS in the ADOS large effect size. They also found that ADOS profiles differed for children with ASD with low MA, GDD, and ASD-higher MA groups. Even though there is a push to diagnose ASD for children under 2 years of age, there is not a commercially available diagnostic tool to diagnose children under 12 months. Future research should focus on establishing a diagnostic tool for children under 2 years of age.

Some of the diagnostic tools can be used to determine if participants meet the research study inclusion criteria and compare the scores after the intervention (Yun et al.,

2017). Yun and colleagues used ADOS as a prescreening measure to confirm the ASD diagnosis prior to meeting the criteria to participate in the social skills training for children with ASD using robots. Parents completed the ADOS questionnaire which was used to compare any changes in communication styles and social interaction after the intervention. Comparative examination of the pre-post ADOS results did not reveal statistically significant improvement in social skills after the intervention. The authors hypothesized that it is likely that the targeted intervention was successful in gaining some skills rather than anticipating the overall improvements in observable social behaviors related to ASD. Although ADOS is primarily marketed as a diagnostic tool, it can also be used to measure progress (Yun et al., 2017).

Meanwhile, Scagnelli et al. (2017) utilized the Vineland Adaptive Behavior Scales to assess the areas of competence and deficits in the children prior to including them in the study to determine if the emergence of spontaneous social behavior and social skills training, identified as targets through this assessment, can decrease challenging behaviors in children with ASD. Using the Vineland Adaptive Behavior Scale the authors preselected the targets for the intervention: manding to peers and adults, parallel play, and spontaneously approaching of others. The authors found that as replacement behaviors increased, problem behaviors decreased for both participants. This in turn demonstrated an increase in the areas of deficits that were assessed by the Vineland Adaptive Behavior Scales.

Measuring Deficits in Social Skills

Ryan et al. (2019) conducted a study that evaluated the effectiveness of a BST program for six adults with ASD. Parents of the participants completed the Autism

Behavior Checklist (ABC) that was used to assess the severity of autism and the Social Responsiveness Scale-Adult Version (SRS-A) to determine the participants' social responsiveness. The Oral and Written Language Scale-II (OWLS) was administered to the participants to determine the level of receptive and expressive language. The participants included in the study ranged from high-functioning autism to moderately severe autism. According to the SRS-A results, these participants' diagnostic characteristics of social impairment ranged from mild to moderate. According to the OWLS scores, the adult participants had severely impaired receptive language skills, meanwhile, their expressive language was even further delayed and compared to that of a 5-year-old neurotypical child. These scores presented low social awareness and communication skills for adult participants with ASD. The results of the study revealed that after 4-15 intervention sessions, all adult participants with ASD mastered the social skills taught using BST. The participants also demonstrated an increase in appropriate social interaction even among the participants who scored in the mild-to-moderate range of ASD in social impairment. It is important to note that it took most participants to master social skills between 4-10 sessions. The participants with the lowest level of receptive and expressive language ability required between 6 to 15 sessions to achieve mastery. This study demonstrates that screening assessments like the ABC, SRS-A, and OWLS can be useful when comparing the data trends for skill mastery.

Aburahma et al. (2021) evaluated the utility of the Social Responsiveness Scale (SRS) for the assessment of social impairment in children with epilepsy since they are at risk of impaired social cognition and autism. The authors used a prospective study over the spam of 5 consecutive months with children older than 2.5 years of age with the

primary diagnosis of epilepsy. To be specific, 101 child participants with epilepsy and 92 healthy child participants with the mean age of 9 years and 6 months were recruited for the study. The SRS tool was applied to all children in both groups that accounted for the control group (no seizures for at least 2.5 years) and the experimental group with one or more seizures in the last 2 years. The SRS scale was completed by the primary caregivers and addressed the following five domains: social awareness, social cognition, social and reciprocal communication, social motivation, and autistic preoccupations and mannerism. As a result, the SRS effectively identified 14 child participants with epilepsy who needed a referral for further psychiatric assessment. Moreover, only 60% of child participants returned for formal cognitive testing which helped to determine the presence of an intellectual disability that was strongly associated with impaired reciprocal social behavior.

In contrast to Ryan et al. (2019) study, Peters and Thompson (2015) conducted a research study with the purpose of assessing the effectiveness of BST to teach social skills to children with ASD. The authors developed their own questionnaire specifically for the purpose of the study where parents of the participants rated their ability to identify and respond appropriately to the listener's interest in a conversation and to identify the participants' interests. The authors also used brief interviews with the participants and clinic staff to collect information about the participants' interests. As a result, after receiving BST, all six participants showed an increase in posing questions to an uninterested listener and changing topics, which were also maintained during the follow-up phase. The overall results of the study served to expand the research on BST to teach social skills to individuals with ASD. Moreover, the outcomes of the study showed that

teaching tacting, labeling, and the listener responding behavior did not aid in the social skills learning process. The specific questionnaire developed for the study allowed the researchers to determine the skills that were in the participant's repertoire before the intervention.

Lorah et al. (2014) conducted a multiple baseline design across six child participants with ASD to evaluate the development and acquisition of peer manding and listener-responding repertoires. They utilized the VB-MAPP Barriers Assessment to determine the magnitude of the participants' weak social skills or a mand repertoire. This in turn aided the authors in the selection of one of the dependent variables for the study: the percentage of independent peer mands. The results of the study indicated that the researchers successfully taught the participants to mand for the missing items required to complete a task and to maintain peer-mediated manding repertoires, which in turn increased their ability to mand and respond to peers' mands. This demonstrated that all three participants improved in their ability to mand for a missing item from a peer even though they entered the study with low manding repertoires according to the VB-MAPP Barriers Assessment. In turn suggesting that the VB-MAPP can effectively be used as a pre-and post-screening tool for skills in the participant's repertoires

Jang et al. (2021) discussed different methods that centers used to adjust to the diagnosis and evaluations of ASD amidst the Coronavirus pandemic in 2019. Typically, an autism diagnosis is given after a comprehensive evaluation inclusive of a clinical interview with caregivers, a standardized observation, and interaction with the child by a clinician. However, the hardship of the pandemic deemed in-person evaluations impossible, and clinicians had to be creative. Some of the methods employed during this

time were conducting the diagnostic interview via telehealth with the caregivers using the DSM-5 or the Autism Diagnostic Interview-Revised (ADI-R), a checklist to be completed by parents to obtain information on co-occurring emotional and behavioral issues, observing children interacting with their parents in structured interactions such as plating with toys, among others. This demonstrated that the tests for autism can be modified to fit the model available such as telehealth or hybrid, however, the data on the accuracy of the implementation of the assessments.

Other assessments that can be used to evaluate social skills are the Social Skills Questionnaire - Parent (SSQ-P) and Teacher (SSQ-T) versions and the Emotion Regulation and Social Skills Questionnaire - Parent (ERSSQ-P) and Teacher (ERSSQ-T) versions (Beaumont et al., 2015). The SSQ can be used to determine the effectiveness of an intervention to improve children's social skills and the ERSSQ can serve as an assessment tool that evaluates the participant's competence in the areas of emotion recognition, emotion regulation, and social skills. Beaumont et al. (2015) used these assessment tools to compare the data that were gathered during the pre-, post-, and follow-up phases of the intervention. Meanwhile, Abels and Hutman (2015) implemented the Early Social Communication Scale (ESCS), a semi-structured measure, to elicit non-verbal communication behaviors from infants during play interactions with the researcher with a focus on joint attention.

Precursor Skills and Benefits of Social Skills

Manding and Listener Responding Repertoire

Lorah et al. (2014) conducted a multiple baseline design across six child participants with ASD to evaluate the development and acquisition of peer manding and

listener-responding repertoires. Because the participants failed to notice and respond to social interactions with others, the authors focused on establishing peer manding repertoires through interrupted chain procedure as well as by forming the appropriate listener responses among the participants. Lorah et al. also evaluated if the participants could generalize the acquired skills to new peers. The authors collected data on independent responses for independent mands and listener responses using trials to criterion design for both speaker and listener responses. During the baseline phase, none of the participants demonstrated mand or listener responding skills. Upon the intervention, all three participants met the mastery criteria for independent mands after the first three sessions. The results of the study indicated that the researchers taught the participants to mand for the missing items required to complete a task and to maintain peer-mediated manding repertoires. This increased their ability to mand and respond to peers' mands. However, neither manding skills from peers nor responding to peers' mands generalized. Future studies should focus on the generalization of peer-mediated manding and listener responding.

Children with ASD have fewer wh-questions (e.g., what, when, where, who, whom, which, whose, why, and how) than neurotypical children, and while the verbal skills may be in a speaker's repertoire, most of the wh-questions focus on tangible mands instead of social mands (Landa et al., 2020). Landa et al. (2020) replicated and expanded the study conducted by Shillingburg et al. (2018) but modified the procedures to establish mands that were more sensitive to social information by conducting an analysis of the controlling variables of said mands. The study participants were two 5-year-old girls and two 7-year-old boys who received daily ABA services at a clinic. The authors

administered the VB-MAPP to all participants as part of their ABA services, and although all participants could mand wh-questions for the location of tangibles, three participants did lack social manding repertoire altogether. Trial-by-trial data were collected on the occurrence of mands for social information and correct responses with preselected criteria for these measures. They used an adapted alternating treatment design to determine the percent of trials with independent mands for social information in the establishing operation versus the abolishing operation condition with a multiple baseline design to evaluate potential generalization across social partners (SP) and a nonconcurrent multiple baseline design to show the effects of the replication of treatment.

Landa et al. (2020) collected IOA data using a second observer for 30% of the sessions using trial-by-trial IOA with a 98.6% average for each participant. Three individuals with ASD served as SP during the treatment sessions consisting of six trials where the therapist asked the participant questions about the social partner depending on the conditions and questions were unknown (EO) and known (AO). None of the participants emitted answers during the baseline and treatment phases with SP1 during the EO condition, however, all participants gave correct responses during the AO condition. This result demonstrated that merely exposing the participants to different types of questions does not affect the mands for information and correct responses. However, once treatment was implemented, most of the participants began emitting prompted mands for information in the EO condition after four to nine sessions. There were higher levels of mands observed during the EO trials compared to the AO trials even after the reintroduction of the AO unobservable probes. Manding was also higher across all participants during the EO trials in comparison to the AO trials. Participants

also responded correctly more frequently during the EO trials after the intervention. These results demonstrate that mands for social information occurred only after the intervention was introduced and were not evoked by just the type of question asked, whether observable or unobservable, and maintained during the EO trials. It is also noteworthy that mands for social information for three out of the four participants occurred across two social partners. This matches the results of the previous study. Unlike the previous study with the modified steps, Landa and colleagues alternated between the EO and AO observable conditions during the treatment and waited for the established discrimination mands prior to reintroducing the AO unobservable trials, only requiring participants to turn towards the SP, and not using EO correction procedures. Mands during the EO conditions occurred at a higher rate for all participants in comparison to the AO unobservable condition. While this study's results are promising, replication of this type of research across other participants with ASD is called for and may assist in determining the social impact of manding for information and variables that influence these mands.

To further expand on the importance of manding for information to further allow children with ASD to access social opportunities, Patil et al. (2021) evaluated the procedures for teaching the mand “why?” to children diagnosed with ASD along with sufficient teaching opportunities using different topography of the mand “why?” and programming for generalization. The study included three children diagnosed with ASD attending an educational program with comprehensive behavior analytic instruction. Before the inclusion in the study, the participants demonstrated mastery of manding for preferred items, manding “where?”, imitating a question/phrase with at least five

syllables, imitating joint attention with at least one type of response for two scenarios, waiting 60 s for a preferred item when presented with the instruction “wait.” A preference assessment was conducted to select establishing operation (EO) that would be used in the experimental sessions along with a skills assessment to determine the skills currently in the participants repertoire. Using a concurrent multiple-baseline design across three scenarios (restricted access to preferred items, emotional responses, and unusual events), the authors successfully demonstrated that consistent with acquisition, all participants demonstrated generalized manding quickly with only one participant, 33%, committing an error during the generalization trial of the no-script condition. All participants, 100% also maintained the repertoire of manding in three different situations and generalized it to novel stimuli, instructors, and locations using full script plus no script session and trials. According to the social validity assessment, the procedures used in the study, although time consuming, were acceptable to reach the results without exceeding a total of 21 sessions for each participant. After learning the mand “why?” the participants manded for additional information and access social situations.

Observational Learning

Taylor et al. (2012) discussed that observational learning (OL) refers to learning that results from observing the responding of others and the consequences of said responses. The author in this study set out to determine if teaching three children with ASD to monitor their peers’ reading responses would lead to the acquisition of sight words using a multielement design. They defined monitoring as imitating the peer’s materials as demonstrated by matching the response. In one condition, the participants observed a peer reading words while the teacher prompted the monitoring response and

in the other condition, the acquisition of a different set of sigh words was assessed while the teacher did not prompt the monitoring responses. The participants had followed two-step instructions, matching words, imitating of vocal responses, and labeling pictures of nouns along with token economies in their repertoire. The depended measure of the study was the percentage of words read correctly during the test sessions and correct responding and matching during the training sessions. As a result, the researchers found that two participants had higher level of correct responding in the training test sessions with slower increase in responding in the exposure test sessions while one participant went from 0% independent monitoring during the first training session to 85% the other started at a higher percent and only reached 77%. On the contrary, the third participant started with low responding during the training session but slowly increased across the phase and the response in the monitoring session was like that of the second participant, ending at 71%. These results suggest that monitoring responses affected the acquisition of the unknown words in the training condition and that learning to attend to the responses of the peers and the instructional stimuli led to better attention to the peer's responses and the instructional stimuli in the exposure condition. Unfortunately, the results did not allow the author to determine if monitoring response facilitated learning, which should be studied in future studies. Future studies should also target the replication of the study with additional subjects and using a stronger experimental design to clarify the relation between monitoring responses and observational learning.

OL is also a prerequisite skill for the development of appropriate social skills. McDonald and Ahearn's (2015) study addressed the assessment, intervention, and generalization of OL skills among children with ASD. There were six participants, ages

8-12, who attended a special education private school for children with ASD and other disabilities. The authors implemented a multiple probe design across participants to evaluate the participants' OL skills across different leisure and academic tasks. The researchers collected data on the percentage correct for each task variation after observation for the pre-and post-assessments. While in the intervention phase, McDonald and Ahearn collected data on the percentage correct of independent responses in each skill. During the preassessment phase, none of the participants performed the OL tasks independently. During the intervention phase, the number of trainings ranged from one to three OL task variations. The authors also observed some generalization of untrained tasks for all participants during the follow-up phase. The results revealed the emergence of the OL skills on untrained tasks which occurred across 80% of participants after the training on a specific task across multiple OL tasks.

Foti et al.'s (2019) study evaluated the effectiveness of teaching children with ASD to develop appropriate decision-making strategies to discover social rules. The authors recruited 16 children with ASD who were around 7 years of age at the time of the study. The tasks presented in the study consisted of building Lego houses after watching a video that showed the participants how to build the house by using OL or trial-and-error method without the use of OL. Data were collected from the recorded tasks, which allowed the researchers to score the on-task completion performance of the participants and their attention to the video. Although all participants' performance improved in the three trials, the participants' performance was lower in comparison to the performance of typically developing children. During the experimental task of learning-by-doing, the participants obtained lower scores when compared to typically developing children in the

first and second trials, but not in the third trial. These results suggest that while children with ASD may lack OL skills, these could be successfully taught. The authors recommended an ongoing evaluation and identification of the OL skill deficits in children with ASD to devise an accurate and targeted intervention for improvements.

Pragmatic Language Skills

Cardillo et al. (2020) defined pragmatic language as the ability to use language effectively to communicate. Deficits in pragmatic language have been found to be a core characteristic of ASD (APA, 2013). The current study focused on studying the link between pragmatic language, theory of mind, and executive functions in children with ASD while focusing on the comprehension of nonliteral language and the ability to make inferences. There were 143 participants out of which 73 had a diagnosis of ASD, and the researchers found that impairment in pragmatic language was a significant characteristic of children with ASD and that those children were also more impaired in the theory of mind and executive functioning than their neurotypical peers. However, they also found that there was a minimal correlation between low pragmatic language abilities and executive functioning. This study results demonstrate that theory of mind is affected by the development in pragmatic language, and, in turn, social skills are hindered.

Thomas and Bambara (2020) discussed that pragmatic language difficulties are evident in adolescents with ASD, and this can hinder their ability to engage in socially appropriate conversations and peer relationships. The participants engaged in high rates of inappropriate communication such as perseveration and abrupt topic shifts. The authors used a multiple baseline design across participants to evaluate the effects of a novel peer-mediated intervention (PMI) on improving the social conversations of three

high school students with ASD. The PMI involved peer training, graphic/text cues, and direct instruction for the participants. The study used PMI to reduce inappropriate communications while supporting appropriate initiations and topic maintenance responses. As a result, all three of the participants effectively reduced inappropriate communication and two participants increased the appropriate communication. The authors also found that conversation gains generalized to untrained peers for all the participants. They also found the social validity of the intervention acceptability and conversations. The study demonstrated that PMI can be used to address the unique pragmatic language needs of high school students with ASD.

Reindal et al. (2021) aimed at using a dimensional approach to study language impairment across a broader range of autistic symptoms among children being evaluated for ASD. The authors had four goals: They investigated the extent of language deficits based on the parents' retrospectively reporting of early language delay. They examined the link between current structural language skills and pragmatic competences with the use of Children's Communication Checklist (CCC-2). They evaluated a potential correlation between early language delay and current language and social skills as measured by the CCC-2 and SRS. Lastly, they analyzed the gender differences in language characteristics. As a result, Reindal and colleagues produced a large-scale multi-site study that investigated neurodevelopmental disorders among children and adolescents in Norway. There were 177 participants of 4-18 years of age with and without ASD diagnosis. Reindal and colleagues reviewed data that revealed the participants' diagnoses, early language development, current language and communication skills, current social impairment, and cognitive abilities. As a result, 81%

of participants were classified as having a language impairment and nonverbal communication being the most affected pragmatic skill as measured by CCC-2. The study also found that current structural and pragmatic language skills were highly correlated regardless of the individual diagnostic characteristics. The authors also found that children in the language delay group performed worse on measures of the verbal IQ with a mean of 15 vs a mean of 16.2.1. However, they did not find a significant difference in the current social skills. There were 82% of males and 79% of females who were identified as language impaired without differing in the overall profile for language impairment. In conclusion, most of the participants had language impairment below the CCC-2 cut-off score. Structural language deficits were common and associated with pragmatic competence. Male participants were more likely to have early language delay when compared to female participants although pragmatic language and social skills did not differ among genders. This, in turn, supports the notion that pragmatic language impairment constitutes a risk factor for structural language, and early language delay is associated with later language abilities and symptoms of ASD. This also showed that females are more likely to be diagnosed with ASD later than males due to having stronger verbal skills and lower rates of language delay. Improving the pragmatic language of children with ASD can aid in diminishing the difference between children with ASD and their neurotypical peers.

Decreasing Challenging Behaviors

Carr and Durant (1985) conducted two experiments to determine if their assessment methods effectively determined the situations in which problem behaviors such as tantrums, aggression, and self-injury are most likely to occur (Experiment 1) and,

in Experiment 2, the researchers determined if Functional Communication Training (FCT) was effective replacement behaviors. The four children selected for the study met predetermined criteria and two were diagnosed with ASD and they displayed problem behaviors fitting those of interest in the study. The sessions were conducted in classrooms near the regular classrooms using two children at a time instruction using an alternating treatment design access difficulty of tasks presented. As a result, in Experiment 1, the authors calculated averages per tasks and attention across the participants. Carr and Durant created two levels of task difficulty one being an easy level with about 100% correct and a difficult level with about 25% correct responses. Meanwhile, in the two levels for adult attention, the high level approximated about 100% attention with the low level being about 33% of the attention. As a conclusion, it is evident that some children have disruptive behavior to escape a difficult task and others to access attention or a mix of both, multifunctional. Experiment 2 tested these functions and determined that all participants' behaviors decreased when taught the FCT skills to replace the disruptive behavior. Overall, both experiments demonstrated that teaching functionally equivalent replacement behaviors can help reduce disruptive behaviors in children with ASD.

Scagnelli et al. (2017) furthered the previous research by conducting a study to determine the emergence of spontaneous social behavior in children with ASD and to demonstrate how social skills training can decrease challenging behaviors using the ABA principles. Two participants with ASD, ages 4 and 5, were taught to mand towards peers and adults and parallel play to determine if there was a potential increase in social interaction and a relationship between social skills acquisition and challenging behaviors. The researchers used an A-B research design with a correlation between social skills

acquired and the rate of challenging behaviors.The research results demonstrated that successful application of the ABA principles with fidelity may lead to increase in frequency and duration of time engaged in social interactions as well as to emergence of spontaneity. As a result, both participants demonstrated increase in parallel play, approaching, and manding. The authors combined all three behaviors to obtain an index of spontaneity where they found decrease in problem behavior and increase in spontaneous behavior after the training. These findings demonstrate that teaching social skills may correlate with a decrease in problem behaviors. The study could have benefited from a follow-up phase and data collection to evaluate the maintenance of skills over time.

Types of Social Skills Training Programs

Peer Network Interventions

Briggs et al. (2018) implemented multiple-probe-across participants design to determine the effectiveness of a paraprofessional-facilitated peer network intervention with four participants in Grades 3 to 5. Peer network is an intervention designed to improve peer interaction and relationships by allowing greater integration into social environments. The peer network interventions include three core features: forming repeated interaction opportunities in shared social activities, having adult facilitation, and training peers to be effective communication partners. The goal of the intervention was to increase peer interaction for students with complex needs and to determine if using peer-implemented augmentative alternative communication (AAC) modeling within the intervention to increase the students' use of symbolic communication such as AAC communication, signs, and speech. The authors found that using the peer network increased students'

overall interactions with peers for all four participants, however, it did not increase their symbolic communication.

Superheroes Social Skills

Radley et al. (2017) focused on expanding the previous evaluations of the Superheroes Social Skills program for young children with ASD. The authors recruited five child participants with and without ASD, ages 4–5, who attended a university-based clinic. A multiple probe design across behaviors with a concurrent replication across participants was used with three experimental phases: baseline, intervention, and maintenance. The intervention phase consisted of a 1.5–2 hr of social skills training over the course of 5 weeks. The training consisted of the four target social skills: nonverbal communication skills, participation, wants and needs, and conversation. The Superheroes Social Skills materials included a television for videos, narrative comics, and play materials for training and probe sessions. The authors collected the percentage of correct steps performed using task analysis adapted from the SST program. As a result of the intervention, two out of three participants with ASD that had language developmental showed mastery of social skills in general. Specifically, three participants improved nonverbal communication skills and generalized them across individuals. In the category of wants and needs, two participants with language skills showed improvements after the interventions phase while three participants improved in the category of conversation training and were able to generalize these skills. In the maintenance phase of the study, nonverbal communication skills training was effective for four participants and three participants were able to generalize the skills. In the section of wants and needs, all participants effectively maintained learned skills and generalized them across individuals.

The study demonstrated that school-age participants with ASD improved their social skills after participating in this study. The maintenance and generalization data indicated that there was a moderate to strong presence of new skills in the training setting therefore, ongoing instruction and review of the social skills may be required. The results also suggest that there should be a minimum level of language development required for the best outcomes. Future studies should place emphasis on collecting long-term follow-up data as well as a component analysis of the social skills program.

Murphy et al. (2018) evaluated the effectiveness of the Superheroes Social Skills program on teaching social skills to middle-school-age children with ASD. The study extended previous research by assessing skill generalization to other settings and across individuals. The authors assessed the effectiveness of social skills training on skill accuracy using a multiple baseline design across skills and participants over three phases. Murphy et al. recruited four boys with ASD who exhibited various social skills deficits. The authors collected percentage of correct responses in the number of steps that were required for a target social skill. As a result of the intervention, all four participants had high skill accuracy in nonverbal communication that were also preserved during the maintenance phase assessment. However, only three participants demonstrated high skill accuracy for performing the *participate* target skills, *wants-and-needs* skills, and *generalize* skills. All four participants showed high accuracy in their responses while expressing their needs and wants. The results of Murphy et al.'s study indicated that the Superheroes Social Skills program was effective for middle-school-age participants and the target skills maintained in novel settings and across individuals.

Teaching Social Skills With Robots

In contrast to the previous studies (Murphy et al., 2018; Radley et al., 2017), Yun et al. (2017) used robots in addition to therapists to teach social skills to children with ASD. The program focused on eye contact and facial-emotional recognition using discrete trial teaching (DTT). Participants of this study were children with ASD, ages 4 and 7, who had full-sentence communication skills and no evident problem behaviors. The social skills training program lasted over eight 30–40 min sessions with the therapist, robot, and child interactions. The study used a combination of rating scales and partial interval recording for the frequency of eye contact and accuracy of facial emotion expression. After participating in the study, the participants improved their play, eye contact, and facial-emotional recognition across participants. The results of this study support the idea that robots can serve as instructors and be used to supplement behavioral interventions for individuals with ASD. The study did not include data on the generalization of the acquired skills. Future research should evaluate the use of social skills training programs with robots across participants and settings.

Secret Agent Society

Beaumont et al. (2015) evaluated a social skills training program for children with high-functioning autism (HFA). The authors investigated a less intensive and cost-effective version of the SAS social skills program for the purpose of teaching students with HFA in a school setting. More specifically, they targeted emotional regulation skills and their implementation by teachers. The study included 69 students with HFA between the ages of 7-12. Condition 1 of the study consisted of the 10 session variants of the original SAS program without direct parental involvement. Condition 2 of the study

involved school staff and their use of the SAS Computer Game Pack with flexibility. Data were collected using checklists for Condition 1 and Condition 2. The study resulted in significant post-treatment improvements in the participants' emotion regulation and social skills. According to the teacher rating scale, the participants in Condition 2 were more proficient in emotional regulation and social skills than those in Condition 1. According to the parent report for rating scales, there was not a significant difference between participants in Condition 1(structured) or 2 (unstructured). The results of the study revealed that direct social skills instruction to students with HFA without a peer training component can be successful. It is important to note that the participants in Condition 1 demonstrated better improvements in social-emotional functioning and behavior in comparison to the results of Condition 2. Contrary to the previous research study by Yun et al. (2017), analysis of the collected data in Condition 1 demonstrated that social skills generalized to the home environment without parental involvement. Parents and program facilitators responded to a questionnaire in which they indicated that future training opportunities should include parental involvement. The authors reported the following study limitations: Hawthorne Effect, self-report bias, and controlled group assignments.

Behavioral Skills Training

BST is an effective teaching model that is widely used to teach skills and instructional procedures (Carnett et al., 2021; Davenport et al., 2021; Kirkpatrick et al., 2021; Lloveras et al., 2022; Rios et al. 2020). It is an evidence-based, systematic method that is grounded in the science of ABA and can be implemented across multiple environments. There are four important components of BST: instruction, modeling,

rehearsal/role-play, and feedback (Wells et al., 2018). They can be used in various combinations to train teachers (DiGennaro Reed et al., 2018; Mahon et al., 2020) and parents (Dogan et al., 2017) to promote social and academic skills among children and youth (Kirkpatrick et al., 2021; Nuernberger et al., 2013; Ryan et al., 2019; Peters & Thompson, 2015).

BST is a structured training model that allows participants to learn via practice which is incorporated in a role-play element of the training. While Kirkpatrick et al. (2021) emphasized the model's rehearsal and feedback components and their effect on generalization and maintenance of the newly learned skills across individuals and environments, Wells et al. (2018) expanded upon the BST's process and stressed the importance of setting and achieving mastery criteria during the role-play sessions. The authors hypothesized that if a participant is offered an opportunity to practice skills beyond what is required as part of the BST's role-play component, they are likely to meet the predetermined mastery criteria. Relying on a multiple baseline across participants design, Wells et al. were successful in implementing BST for classroom data collection training and differential reinforcement of incompatible behavior procedures for one student with elopement behavior. The baseline data revealed on average 1.6 elopement behaviors during the three transition periods. There were zero elopement events during the first and third transition periods. Overall, the BST model was successful in teaching and reinforcing the incompatible behavior and keep the participant safe from potential elopement.

Relying on Wells et al.'s (2018) recommendations, Mahon et al. (2020) used a multiple baseline design across participants and set a mastery criterion for the BST's

role-play component. Mahon et al. implemented a social skills training across three preschool teachers who taught preschool age children. The social skills lessons for preschoolers also incorporated the BST model and addressed the four potential functions of behavior during the instructional and rehearsal components. Moreover, the participants engaged in learning about the appropriate replacement behaviors prior to implementation of the newly acquired skills in the natural environment. The results of this study revealed improvements in social skills and on-task behaviors among preschool student participants. In addition, the visual analysis of data demonstrated a decreasing trend in problem behaviors for all student participants.

The BST model was investigated by Kirkpatrick et al. (2021) in a multiple baseline design that was used in this research study. The authors trained five pre-service teachers in implementing a token economy for children with and without disabilities who received reading intervention at the time of the study. Using the literacy instruction, Kirkpatrick and colleagues applied a token economy with the child participants at the end of the school day using a fixed 1-minunte-interval reinforcement schedule. After the participants earned five tokens, they could exchange them for a backup reinforcer. It is important to note that during the role-play component of BST, all teacher participants performed at 100% when implementing the token economy. By the end of the study, all teacher participants met the mastery criteria and found BST to be effective as measured by the social validity questionnaire.

Dogan et al. (2017) evaluated the effects of BST as a teaching tool to train four parents of children with ASD using a multiple baseline design and defining the specific skills and responses of parent and child participants. All children had an IQ of 70 or

greater and were either diagnosed with ASD, Asperger's syndrome, or pervasive developmental disorder - not otherwise specified. All training took place at the residences of each parent-child dyad in a room containing a table and chairs for all participants, and training staff and the BST handouts were provided for each parent during all phases following baseline. The dependent variable was the percentage of BST steps correct where parents had to perform correctly 5 out of 15 steps. The second dependent measure was the number of correct social skills steps performed by the children during each trial more specifically in joining a conversation and asking for help. After receiving training, all parents improved to a range of 77% - 97% of correct BST steps. Meanwhile, the child participants improved their performance of correct steps with BST being the highest score ranging from 12% as the lowest score to 88%. Evidently, the intervention of BST using instructions, modeling, role-playing, and feedback was effective at increasing the parents' correct use of BST for social skills instruction and this generalized to social skills not included in training. Although the children did not meet mastery criteria the skills maintained a month later parents reported high satisfaction with the BST intervention. Some limitations did arise: For example, the basic components of BST were broken into 15 more detailed steps and the strict operational definitions did not allow for flexibility and creativity of parent behavior. A less strict mastery criterion would have been helpful given that the training was brief. This study does extend the services that children with ASD can access by having their parents target social skills training and further aiding in their socialization.

However, Nuernberger et al. (2013) examined a BST model that contained role-play, in-situ training, and reinforcement components to teach vocal and non-vocal

conversation skills to young adults with ASD using a multiple baseline design across participants. The in-situ training sessions were implemented when the participants demonstrated stability or a decreasing trend in the baseline conversation phase. Nuernberger and colleagues collected data for the correct steps completed during the demonstration of the target conversation skills following a task analysis and reported it as a percentage of correct responses. During the baseline phase, two out of three participants engaged in variable responding rates while one had stable responding. During the BST phase, the percentage of correct responses increased for all three participants and maintained during the maintenance phase. Two out of three participants took part in the follow-up sessions demonstrating maintenance of correct responding. As a result of the study, BST was effective in teaching young adults with ASD vocal and non-vocal conversation skills. The study also demonstrated the importance of maintenance and generalization of skills to natural environment.

Ryan et al. (2019) advanced research efforts on BST by conducting a study to determine if BST can be used to increase appropriate conversation interactions for six adults with ASD using a multiple probe design across participants. The authors implemented an instructional component of BST that addressed conversation skills, modeling, practicing conversations, and delivering immediate feedback on conversation performance in a small group setting. The study also evaluated the social validity of the intervention and collected interobserver agreement and treatment integrity data. All participants mastered the social skills within 4-15 sessions with generalization of skills. The study results demonstrated that BST increased appropriate interactions among adults with ASD in small group instructions, peer observation during practice, and feedback

sessions of BST. The results of the social validity assessment revealed the BST's positive impacts on the learners. Future research should evaluate the generalization of conversational skills to natural environments.

Peters and Thompson (2015) also examined the use of BST to teach social skills to children with ASD. The authors recruited children with ASD who were 4-9 years of age at the time of the study. The authors focused on teaching the participants to respond based on their listener-responding skills. Peters and Thompson used a multiple baseline design across participants. Experiments 1 and 2 of the study focused on teaching participants to ask questions and change topics. During Experiment 3, participants were taught to use other learned responses if they failed at regaining the listener's interest. During baseline, none of the participants asked questions when the listener appeared uninterested and either excessively engaged in previously reinforced behaviors such as repeating the experimenter's name or ignoring the experimenter's presence during Experiment 1. During the intervention phase, all participants were exposed to BST. During the post-training conversation probe data collection, only one participant asked a question of an uninterested listener. In the post-training phase, three out of four participants began asking questions of uninterested listeners. The results of Experiment 2 showed that only one out of six participants asked questions and changed the topic during baseline. After receiving BST, all six participants showed an increase in posing questions to an uninterested listener and changing topics, which were also maintained during the follow-up phase. The outcomes of Experimenter 3 demonstrated that BST was effective for three out of four participants in asking questions during the changing the topic phase. The overall results of the study expanded previous research on the use of BST with

individuals with ASD and demonstrated that the listener responding skills could be maintained over time without using contrived reinforcement. This study showed that tacting, labeling, and the listener responding behavior did not produce the anticipated results and questioned the use of tacting nonvocal social responses, which are commonly used in social skills training. The study does outline a set of procedures that could be used in future research.

Generalization of Social Skills

Schaefer et al. (2017) conducted multiple probes across participants research design to improve social interactions and academic engagement for students with severe disabilities, examine the efficacy of peer support groups, and measure the degree of generalization of social skills to the cafeteria and recess yard. The study included three middle school students with severe disabilities who attended at least one general education class. Schaefer and colleagues recruited two neurotypical peers for each participant with disabilities who attended the same general education class, spent time in the cafeteria, and worked well with the adult. The primary dependent variable was the number of interactions in way verbal or nonverbal behavior directed from or toward the participants. To collect data, Scaefer et al. (2017) used partial interval recordings that were 15 s in duration with 15 s of recording across all phases and settings. The three phases included a baseline, intervention in the general education classroom, and intervention in the generalization setting. Treatment fidelity was collected across 27.3% of the observations across phases and calculated point-by-point agreement along with determining the social validity of the intervention. As a result of the intervention the interactions between students with severe disabilities and their peers increased across all

participants with minimum generalization across settings. The collected data did not reveal any information relative to the intervention's effect on the target student's academic engagement. The findings not only extended social skill acquisition literature for children with disabilities, but also demonstrated that a goal-setting strategy can ensure generalization across settings and individuals. The results of the study contribute to the best practices for inclusion of students with severe disabilities and generalization of social skills.

Ko et al. (2018) further expanded the research using the Social Tools and Rules for Teens (START) socialization program for adolescents with ASD. The authors emphasized pre and post intervention changes in verbal and non-verbal social behaviors during naturalistic conversation probes between participants and novel, untrained peers. The participants of this study were adolescents with ASD between 12-17 years of age. The participants completed a series of questionnaires such as the SDS-r, the Kaufman Brief Intelligence Test, Second Edition (KBIT-2), along with parental participation in weekly meetings. Although 40 participants were originally assigned to random groups using a randomized control trial (RCT) design, due to attrition, only 35 participants completed the study. The study included pre-intervention sessions, target skill selection, and self-management based on each participant's needs over the course of 5 weeks. Participants took part in the individual check-in sessions, a 20-min session of unstructured socializing time, a 40-min social topic discussion and practice session, and a 20-min structured social activity phase with icebreakers and games along with a check-out session. Fidelity checks of the study revealed a 97.7% compliance across all procedures. The results of this study demonstrated significant increase in interaction

among the treatment group participants. However, the authors did not notice a statistically significant change for mutual engagement during the intervention phase. This suggests that the focus of intervention should be on the importance of social inquiries and the use of positive facial expressions during START sessions because these are crucial skills for adolescent social interactions and for adolescent adult interactions. Future studies should target the reported limitations of this study such as shorter time frame for collecting conversation probes and attention to potential reactivity to observers.

MacFarland and Fisher (2019) tested the procedures of peer mediated interventions and video-based group interactions to determine if it was possible for a peer-mediated intervention using video-based group instruction to generalize social skills among four high school students with ASD. The authors used a multiple probe across behaviors design to determine if the intervention was effective in generalization of social skills to three natural settings in the participants' high school. After receiving video-based group instructions with peer-mediated intervention for training on the generalization of social skills, performance across all three participants increased after training across the generalization settings. MacFarland and Fisher demonstrated that using video group instruction along with peer-mediated intervention can be an effective method for practitioners to promote generalization within and beyond schools when teaching social skills. This, in turn, ensured socially significant change can be demonstrated across settings and situations as well as time. One limitation that was seen in the study is that the Domain 3 social skills were generalized without the use of video group instruction along with peer-mediated intervention. Future research should focus on expanding the findings and targeting the limitations.

Kornacki et al. (2013) conducted a multiple baseline design with an add-in component analysis across the three young adults with ASD in a residential facility. They evaluated effects of a BST package inclusive of instructions, modeling, rehearsal, rehearsal with feedback, in-situ training with feedback, and in-situ training with reinforcement to teach the participant conversational skills. The authors devised and implemented the task analysis to include both vocal and non-vocal conversation skills such as making comments or staying on topic. All three participants improved their responds skills and two out of the three were able to maintain their conversation skills after the maintenance checks. This study demonstrated that the BST training package, along with the components added, can successfully be used to teach conversational skills, however, some components can be modified based on the participants' skills and needs. This shows that there is no specific component that is responsible for the acquisition of the skill. Future researchers should study the effects of a reinforcement component in the maintenance of social skills.

Research Questions

1. What is the effect of BST on one child with ASD performance accuracy of three social skills as measured by Task Analysis Sheet?

2. What is the effect of BST on one child with ASD social skill acquisition as measured by SRS-2?

3. How do parents rate BST as a socially valid strategy for teaching social skills to one child with ASD as measured by the social validity survey?

Chapter 3: Methodology

Participants

Children diagnosed with ASD exhibit various deficits in social communication and interaction with others, the concept of friendship, social norms, and many other socially appropriate behaviors require targeted intervention and effective training at an early age (Radley et al., 2017; Ryan et al., 2019). As such, the researcher recruited one 4-year-old child participant with ASD, who possessed the prerequisite verbal skills such as mands and intraverbals in his repertoire, imitated non-verbal behavior, and responded to feedback as prescribed by the BST model. The participant was recruited from a learning center for children with ASD located in South Florida. The ASD diagnosis as well as any potential communication, hearing, visual, and motor impairments of the participant were confirmed by reviewing the participant's records. The need for social skills intervention was assessed with the use of the Social Responsiveness Scale-2 (SRS-2). The researcher employed a convenience sampling approach because the participant was available at the time of the study and possessed a set of characteristics that were of interest to the researcher (Gay et al., 2012). Written informed consent was obtained from the participant's parent before the final confirmation of enrollment in the study.

Instruments

According to Cooper et al. (2020), instruments used in the field of ABA are typically unique to the type of research and most practitioners develop their instruments to fit their research goals and objectives. The instruments used in this study included the SRS-2 (Appendix A), Social Validity Survey (Appendix B), Task Analysis Sheet (Appendix C), Treatment Fidelity Checklist (Appendix E), and Interobserver Agreement

Form (Appendix F).

Social Responsiveness Scale

The Social Responsiveness Scale (SRS) was published by Constantino and Gruber in 2005 as the first widely used quantitative parent/teacher report to measure social characteristics of ASD in clinics, education, and general population settings (Bölte et al., 2008; Western Psychological Services [WPS], 2023). The SRS-2, which is the latest edition of the original SRS, examines the reciprocal social behavior and social-communicative abilities, which are both related to ASD, as well as other items frequently observed as symptoms of individuals with ASD (Constantino & Gruber, 2012; Nguyen et al., 2019). The SRS has been validated in studies in high-income countries outside of the United States where the studies had similar results to those conducted in the United States (Nguyen et al., 2019). According to WPS (2023), the SRS-2 was updated by the original authors in 2012 and validated on a sample of 1,906 individuals who represented various genders, ethnicities, education, and geographic regions. As a widely used parent or teacher rating scale, the SRS-2 is designed for ages 2.5 through 18 years and allows for adult self-report and other reports for ages 19 and older. It consists of 65 items that are rated on a 4-point Likert scale ranging from 0 (near true) to 4 (almost always true). The SRS-2 consists of two scales: Social Communication and Interaction (SCI) and Restricted Interests and Repetitive Behavior (RIRB) as well as the fur SCI subscales: Awareness, Cognition, Communication, and Motivation. With the permission from Western Psychological Services (2023), the SRS-2 was used as the assessment of social skills of the participant before and after the application of BST. It was administered to the participant's parent. The parent completed SRS-2 in no more than 15–20 min. An

example of the SRS-2 survey questions accounts for the following socially observed behaviors: The child "seems much more fidgety in social situations than when alone" or the child "seems more self-confident when interacting with others."

The researcher collected the SRS-2 data, evaluated the raw scores, and converted them into T-scores. The raw scores of each domain were combined and converted into the SRS-2 Total T-score. A possible T-score for each domain may range from 32 points to 114 points (Constantino & Gruber, 2012). The SRS-2 Total T-score of less than or equal to 59 indicates no deficits in social interaction. The T-score of 60–65 suggests mild-to-moderate deficits in social interaction, while the T-score of 66–75 serves as a sign of moderate deficits in social interaction. A T-score of greater than or equal to 76 is indicative of severe deficits in social skills and is strongly associated with a clinical diagnosis of ASD.

Social Validity Survey

The purpose of using a social validity assessment is to evaluate the training's effectiveness and acceptability (Cooper et al., 2020). Wolf (1978) discussed that social validity should evaluate the social significance of the goals, the social appropriateness of the procedures, and the social importance of the effects. The concept of social validity was first established in the Journal of Applied Behavior Analysis in the 1970s (Cooper et al., 2020).

Peters and Thompson (2015) created a social validity parent survey to determine the BST model's social acceptance (Appendix B). With permission from Peters and Thompson, the original social validity survey was used in this study. The survey was designed to evaluate the use of BST for teaching social skills to children with ASD. The

survey is a four-question 5-point Likert scale that rates items as 1) *Strongly Disagree*, 2) *Disagree*, 3) *Neutral*, 4) *Agree*, and 5) *Strongly Agree*. The survey was slightly modified to match the questions in the study with Question 1 aiming to evaluate if the implementation of BST was effective in improving the accuracy of target social skills in young children with ASD. Question 2 was designed to assess a perceived acceptance of BST in improved accuracy of target social skills in young children with ASD in a natural setting. The implementation of BST as an effective model to improve the social functioning of young children with ASD and other disabilities was at the center of Question 3. Question 4 aimed at evaluating the effectiveness of the study. Both parents completed of the survey in no more than 10 min.

The sum of the individually selected choices from the 5-point Likert scale for each of the four questions of the Social Validity Survey produced the global indicator of the parents' perception. The total amount was divided by the total amount of the survey questions to obtain the global score for each parent. For example, if a parent indicated "The Behavioral Skills Training was an effective training to help my child learn social skills" (Score 1), "The overall Behavioral Skills Training effectively improved the accuracy of target social skills in my child in the training setting." (Score 2), "The Behavioral Skills Training model improved the accuracy of the target social skill in my child in the generalization setting." (Score 3), and "I would recommend this training as well as techniques and approaches of self-advocacy to others. (Score 4), the calculation of the global score read 1 + 3 + 2 + 5: 4 = 2.75. The ideal global score is 5. Descriptive statistics were used to discuss general tendencies in the social validity data.

Materials

The materials required for this study are the data collection sheets for data recording on the steps completed correctly, the implementation guideline of the BST model for social skills, and physical materials for role-playing (e.g. cards, board games, writing tools, etc.). Hensley et al.'s (2005) task analysis fill-in sheet (Task Analysis Sheet, Appendix C) for the acquisition of a particular social skill was adapted for this study. From this Task Analysis Sheet, the trained instructor checked off the steps that were completed correctly and a prompt level.

Relying on the Nuernberger et al.'s (2013) application of BST, the researcher used the BST guideline (Appendix D) to account for the appropriate use of the BST components to include instruction, modeling, role-play, in-situ training for rehearsal, and reinforcement components as feedback. Additional materials included instructional aids for conducting role-playing, participating in rehearsal, and playing board games.

The researcher relied on the content of the *Tools for Teaching Social Skills in School* book by Hensley et al. (2005) to select social skills with task analysis steps as the intervention for the participant. It outlines 16 foundational social skills for students and an additional 12 social skills that are teacher recommended. The first 16 foundational social skills were targeted for the study participant and narrowed down to three particular social targets: greeting others, using an appropriate tone of voice, and anger control. In preparation for the intervention, each step of the target social skill was listed in the task column of the Task Analysis Sheet. The trained instructor scored (+/-) as the participant completed the corresponding step and the prompt level. The final score was calculated for the acquisition of each social skill by tallying the steps and dividing the number of

correctly completed steps by the total number of steps (e.g., 8/10= 80%). The task analysis included specific and desired outcomes of the skill, essential components of the skill that are arranged in the order of acquisition, and behavioral components of the skill.

Measures

Performance accuracy of the three target social skills (greeting others, using an appropriate tone of voice, and anger control) was the dependent variable. The researcher calculated the percentage of steps completed correctly by the participant during the baseline, intervention, and maintenance phases. The independent variable was the BST model. The implementation of the BST model to teach social skills included instruction, modeling in the form of role-play, in-situ training for rehearsal, and reinforcement components as feedback (Nuernberger et al., 2013). The participant was trained with the use of the target social skill task analysis adapted from Hensley et al. (2005). The trained instructor rated the completion of each step and apply the check marks to the correctly completed steps. The instructor gave the participant a cue to engage in a target social skill using games or toys (e.g., “What is your favorite game?” “Ask your teacher to play with you.” “Go tell Mr. Nice what you did on the playground”).

Design

Ledford and Gast (2018) discussed that a multiple probes (MP) design can be practical in applied research since it measures program efficacy, does not require withdrawal of the intervention, and is easy to conceptualize and implement. The MP design is often used in educational settings with three or more participants who may exhibit similar knowledge or deficits in skills that may require an intervention. It is well suited for meeting the goals of educational research such as this one that seeks to improve

vital skills and assess the instructional model that may have been effective with a few individuals but would benefit from generalization and application to other participants. Moreover, it is applicable to this type of study because of its potential to demonstrate experimental control and effectiveness of the BST across the three target skills of one participant.

The MP was the experimental design of this study. According to Ledford and Gast (2018), the MP design assesses treatments that aim to improve trial-based or non-reversible behaviors that are typically desired in the academic setting. Because numerous trial-based and non-reversible behaviors are important to the academic setting, sets of behaviors rather than single behaviors are subject to evaluation. For example, if teaching a child social skills, the researcher may assign several social skills to the first tier, several different social skills to the second tier, and a few other social skills to the third tier. By doing so, the social skills acquisition is the same across tiers, but the specific social skills are different. This application of the MP design is practical rather than experimental in nature. It allows for ensuring that the child attends to relevant stimulus features. While this is a recommended practical way to use the MP design, the researcher followed Radley et al.'s (2017) application of the MP design.

When the MP is used, it may present a few problems because the participant must present with several social skill deficits that may be difficult to target when teaching sets of skills that are likely to covary based on the previously taught behaviors (Ladford & Gast, 2018). In addition, acquisition of social skills calls for frequent and concurrent monitoring. It may be time-consuming and distracting. The MP allows a child to receive training throughout a study, which makes it more practical.

Procedures

Data Collection Procedures

The researcher began the process by securing written permission from a therapeutic learning center for young children with ASD and other developmental disabilities located in Florida. After obtaining the NSU Institutional Review Board's approval, the researcher initiated the recruitment of potential participants for the study. A one-page recruitment flyer was given to the potential participants' parents in person. It was also posted on the site's information board. A parent consent form was hand-delivered to the interested prospective parents of participants. The researcher met with the parents to review the form, answer questions, and obtain a signed written consent. The researcher administered the SRS-2 to the potential participants' parents. Upon review of the SRS-2 results and historical records, one 4-year-old participant was invited to participate in the study.

The researcher identified and defined the three target social skills: greeting others, using an appropriate tone of voice, and using anger control. The participant's skill deficits were matched to the foundational social skills that are described by Hensley et al. (2005). The researcher randomly assigned the three social skills and concurrently collected probe data for all three skills. When data were stable for three consecutive sessions, the researcher intervened with the use of BST on each social skill one at a time beginning with greeting others, using appropriate tone of voice, and anger control in the course of 10 sessions. The researcher administered the last maintenance probe after 9 days passed from the time when all social skills have been taught.

In the initial probe condition, the participant had free access to toys, games, and

leisure activities in the training setting. A cue for a target social skill was delivered by a trained instructor. A different trained instructor delivered cues during the maintenance phase. All cues were delivered on a 5-second constant time delay. If the participant did not engage in the target social skill after a 5-second time delay, all steps on the social skill acquisition checklist were marked as incomplete. Praise was provided for compliance to the facilitator's request, but no performance feedback, attention, or other social reinforcement followed. Attention or social reinforcement was provided for accurate performance of the target skill during the probe conditions.

At the beginning of each intervention session, the facilitator shared with the parent a rationale for the target social skill acquisition and use. The trained instructor modeled each step of the skill to the participant. The participant engaged in three to five role plays of the target skill and received immediate feedback. The researcher and trained observer collect the fidelity and reliability data. The researcher administered a post-intervention SRS-2 and social validity survey to the participant's parents at the end of the study.

Internal Validity

According to Ledford and Gast (2018), there are several common threats to the internal validity of the MP design such as history, maturation, instrumentation, procedural infidelity, testing, attrition, adaptation, Hawthorne Effect, multiple treatment interference, and instability. The internal validity threats most relevant to this study were history, instrumentation, procedural integrity, and attrition. The researcher addressed the history threat by approaching data collection until data were stable and without changing conditions. Instrumentation was controlled by using the trained observer, and having a

discrepancy discussion. Procedural integrity was controlled by training and retraining implementers and providing checklists.

Social Validity

In the field of ABA, social validity assesses the applied value of the behavior changes and the treatment that accomplished those changes (Cooper et al., 2020). Social validity involves measuring the significance of the behavior changes of participants, the appropriateness of the intervention, and the social importance of the results (Cooper et al. 2020; Ledford & Gast, 2018). Teaching social skills to young children with ASD is an important skill acquisition practice that is normally validated by parents or caregivers, teachers, and those who work closely with the child with ASD in the natural environment. In this study, social validity will be measured via the social validity survey (Appendix B). It addresses the caregivers' satisfaction using a rating scale and contains statements to rate the effectiveness of the training intervention and overall satisfaction with the social skills taught.

Generalization is another important component of ABA that demonstrates the social significance and application of learned skills in other places or times without having to be retrained on the skill or emitting functionally related behaviors that were not taught (Cooper et al., 2020). Cooper and colleagues described three forms of generalization: setting/situation generalization, response generalization, and generalized behavior change. Setting/situation generalization is when the learner emits the target behavior in a setting outside the training setting. Response generalization is when the learner emits an untrained response functionally equivalent to the trained target behavior. A generalized behavior change can take place when the learner engages in the new skill

in environments under contrived conditions. However, a maximum behavior change may occur when the learner emits a newly acquired behavior or functionally related behaviors not previously observed in other settings without prompts after the intervention is terminated. The latter was a target goal of the current study.

Reliability of Measurement

The researcher and trained observer collected interobserver agreement (IOA) data throughout all phases of the study. The IOA data collection sheet was the same as the Task Analysis Sheet because the latter evaluated the task analysis implementation steps that were of interest (Appendix F). IOA was calculated by determining the number of agreements in steps completed, dividing by the total number of agreements and disagreements, and multiplying by 100 (Radley et al., 2017).

Treatment Fidelity

Ledford and Gast (2018) defined treatment fidelity as the degree to which the procedures are implemented as intended. Maintaining high treatment fidelity is an essential component of the single-subject methodology because it ensures the study's methodological integrity during intervention and data collection procedures. It helps to demonstrate the overall reliability, replicability, and feasibility of the procedures. The National Autism Center (NAC) views treatment fidelity as one of the dimensions for evaluating the scientific merit of a study (Cooper et al., 2020). A score of 80% accuracy during a minimum of 25% of the sessions, in addition to (an IOA of $\geq$ 80% is considered to be the highest score for treatment integrity according to the NAC's Scientific Merit Rating Scale (Cooper et al., 2020). The researcher utilized a treatment fidelity checklist based on the procedural implementation to determine if the facilitators

implemented the intervention as intended. The treatment fidelity checklist (Appendix E) includes all of the steps that the facilitator implemented during the study.

Data Analysis Procedures

The researcher used a combination of descriptive statistics and visual analysis of data. Each target social skill was assessed by calculating the percentage of task analysis steps completed correctly by the participant during the probe, instruction, and maintenance phases of the study. The mean percentage correct across all target skills was also calculated across all three phases, exported to Microsoft® Excel, and formatted into a line graph. Then, the researcher engaged in visual analysis of data for trend, level, and variability across the three conditions and the extent to which the intervention influenced the dependent variable. The line graph was created with the progression of probe sessions on the x-axis and the percentage of steps correct on the y-axis. The percentage of nonoverlapping data (PND) was calculated using the procedures outlined by Scruggs et al. (1986). Descriptive statistics were used to evaluate general tendencies in the social validity data.

The pre and post-SRS-2 Total T-scores for the participant were presented in a comparative table format. The pre-post SRS-2 results were evaluated by relying on Constantino and Gruber's (2012) guidelines for the SRS-2 data assessment. If the participant were to receive the SRS-2 Total T-score of less than or equal to 59 on the post-assessment in comparison to the pre-assessment T-score of 60 or above, the researcher would hypothesize that the BST intervention was successful in improving the participant's target social skills. The large difference between the pre and post-assessment scores would be indicative of some level of statistical significance of the

intervention effect.

Chapter 4: Results

Introduction

This study examined the effectiveness of BST on teaching one child with ASD, age 4, preselected social skills: greeting others, using an appropriate tone of voice, and anger control. The study assessed the target skills for maintenance.

Demographic Characteristics

The participant, Julian, was 4 years old when he enrolled in the study and turned 5 years of age by the time the study was completed. Julian is diagnosed with ASD. He received an official diagnosis when he was 2.5 years of age. Julian began receiving ABA therapy at the age of 3. He has been continuously exposed to a high-intensity one-to-one ABA therapy that targets reduction in maladaptive behavior including self-injurious, self-stimulatory, and aggressive behaviors along with severe episodes of tantrums. He possesses a limited expressive verbal repertoire of less than 25 words. At the time of administration of the SRS-2 pre-test, Julian already had a verbal repertoire consisting of three-to-four-word sentences and sought out social contact or attention by engaging in socially inappropriate behaviors inclusive of high pitch yelling above normal speaking voice, invading personal space, and engaging in excessive episodes of tantrums when upset.

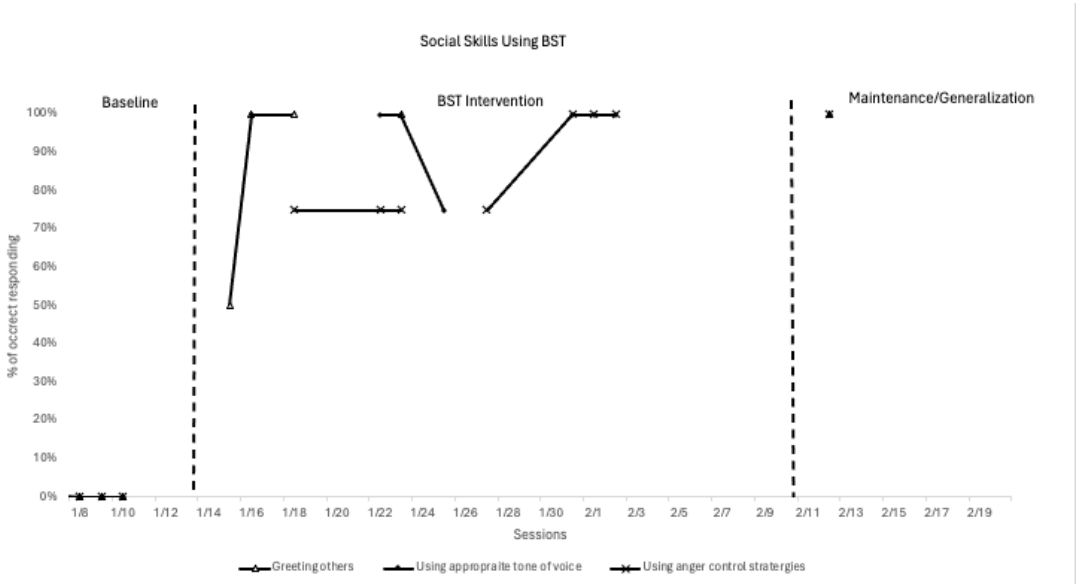
Data Analysis

Results of the baseline session, BST intervention with three social skills, and maintenance sessions across one participant, Julian, are visually presented in Figure below. At the baseline, the mean percentage of correct responses for Julian was 0% across the three social skills: greeting others, using an appropriate tone of voice, and

using anger control strategies. Julian's mean percentage of correct responses for greeting others was 90% during the intervention phase. Julian's mean percentage of correct use of an appropriate tone of voice was 96% during the intervention phase. Meanwhile, Julian's mean percentage of correct responses without being angry was 84% during the intervention phase. During the maintenance phase, Julian maintained 100% correct responses across all three social skills following the BST intervention.

Figure

Julian's Mean Percent of Correct Responses Across Three Social Skills



The researcher engaged in visual analysis of data to evaluate for presence of functional relationships between the sets of data points across three phases. Relying on the guidelines described by Cooper and colleagues (2020), the researcher assessed the data for trend, variability, and level for the three target behaviors across all phases. Julian demonstrated a flat trend with no variability at a low level in baseline across all three target skills. The social skill of greeting others increased drastically in its level from baseline to the intervention phase showing an accelerated trend (range = 40–50% and

100%) and remained stable and flat in the maintenance phase. The social skill of using an appropriate tone of voice increased in its level from baseline to the intervention phase showing low variability in the intervention phase (range =75%–100%) and maintaining a stable level in the maintenance probe. Of note is Julian's last probe of this social skill which demonstrates a decelerating trend from 100% to 70%. Julian's use of the anger control strategies was probed twice across six data points during the intervention phase. The anger control skills increased drastically from baseline to intervention and had a stable level with no variability at the 75% mark. The subsequent evaluation of the following three data points showed an upward trend towards the tail end of the intervention, which was then maintained in the maintenance phase.

Evaluation of the SRS-2 pre-test results revealed that Julian's T score was 74 placing him in the moderate range which is typical for children with ASD with moderate severity of autism spectrum. It is also indicative of the clinically significant deficiencies in reciprocal social skills that may interfere with his everyday social interactions. The SRS-2 post-test results showed a T score of 73. This score still places him in the moderate range, but since it was slightly reduced, the interventions for social skills using BST could be deemed somewhat effective. Parental anecdotal reports attested to the effectiveness of intervention in teaching Julian to greet with appropriate tone of voice and without anger.

Based on the treatment fidelity checks completed for 25% of the session, treatment was implemented with 94% fidelity for greeting others, 95% for using appropriate tone of voice, and 83% for using anger control strategies.

The PND scores for greeting others were at 80%, using appropriate tone of voice at 77%, and using anger control strategies at 44%. Relying on the PND score interpretation that was presented by Scruggs et al. (1986), a PND of 70% or more is indicative of the intervention's effectiveness. A PND score below 50% should be considered ineffective.

Results of the social validity survey revealed that the parents strongly agreed across all five questions. To be specific, parents reported that BST was an effective training in helping the child to learn social skills. The parent also strongly agreed as to the intervention's effectiveness in improving the accuracy of performance of the target social skills in the training setting and outside of the home. The parent stated that she would recommend the intervention to others.

Chapter 5: Discussion

Introduction

Several social skills training programs have shown effectiveness for children with ASD, including Superheroes Social Skills Training (Murphy et al., 2018; Radley et al., 2017), robots (Yun et al., 2017), SAS (Beaumont et al., 2015), and BST (Nuernberger et al., 2013; Ryan et al., 2019). These programs typically focus on children ages 7 and above (Nuernberger et al., 2013; Peters and Thompson, 2015; Ryan et al., 2019), leaving a research gap regarding the application of BST for younger children with ASD ages 4–8. This study aimed to address this gap by exploring the use of BST for one 4-year-old child with ASD. Relying on a Nuernberger et al.'s (2013) BST's application with the use of role-playing, in-situ training, and reinforcement components, the researcher evaluated the effectiveness of BST on teaching one child with ASD to socialize with others by learning how to greet others, use an appropriate tone of voice, and employ anger control when necessary.

The researcher followed Radley et al.'s (2017) implementation of the MP design. According to this approach, a new target social skill should be introduced when 80% of participants demonstrated 100% accuracy in both the training and generalization phases across three consecutive probes. This approach ensures that all participants receive instructions in the target skill before moving on to the next skill acquisition.

Summary of Findings

During the baseline phase, Julian exhibited a mean percentage of correct responses of 0% across the three targeted social skills: greeting others, using an appropriate tone of voice, and employing anger control strategies. The baseline results

show a consistent, low level of performance with no discernible variability across all three skills. In contrast, during the intervention phase, Julian's mean percentage of correct responses for greeting others surged to 90%. This significant increase demonstrates a marked improvement from the baseline, displaying an accelerated trend (ranging from 40% to 50% to 100%) and maintaining a stable level during the subsequent maintenance phase. Similarly, Julian's mean percentage of correct use of an appropriate tone of voice was 96% during the intervention phase. This represents a notable elevation in performance compared to baseline, which is characterized by low variability throughout the intervention phase (ranging from 75% to 100%) and maintaining a consistent level during the maintenance probe. Furthermore, Julian's mean percentage of correct responses without exhibiting anger reached 84% during the intervention phase. This skill acquisition has also undergone a substantial increase from baseline to intervention with a stable performance level observed at approximately 75%, showing minimal variability. During the maintenance phase, Julian demonstrated a 100% correct response rate across all three social skills following the BST intervention, indicating the enduring efficacy of the intervention in maintaining positive behavioral outcomes.

Upon analyzing the pre-test results of the SRS-2, it was determined that Julian's T score was 74. It positioned Julian’s skills within the moderate range, which is also aligned with the typical profile for children diagnosed with ASD on a moderate severity scale of the autism spectrum. Following the intervention, the post-test SRS-2 results indicated a T score of 73. While Julian's score remained within the moderate range, the slight reduction suggests a marginal improvement.

After conducting treatment fidelity checks for 25% of the sessions, it was found that the treatment was executed with 94% fidelity for greeting others, 95% for employing an appropriate tone of voice, and 83% for utilizing anger control strategies. The PND scores for greeting others were at 80%, for using an appropriate tone of voice at 77%, and for employing anger control strategies at 44%. Following the interpretation guidelines outlined by Scruggs et al. (1986), a PND score of 70% or higher indicates the effectiveness of the intervention.

The outcomes of the social validity survey indicate unanimous agreement from the both parents across all five questions. They expressed strong agreement that BST was effective in facilitating their child's acquisition of social skills. Furthermore, they strongly affirmed the intervention's effectiveness in enhancing the accuracy of their child's performance of the targeted social skills both within the training environment and in settings outside of the home. Additionally, the parents expressed a willingness to recommend the intervention to others based on their positive experiences.

Interpretation of Findings

The BST intervention effectively enhanced the proficiency of the target social skills of one young child with ASD within the training environment. The BST implementation resulted in successful acquisition of greeting others, using an appropriate tone of voice, and anger control. However, according to the PND results, the effect of BST on the participant’s anger control was ineffective. According to Allison and Gorman (1993), PND probabilities may fluctuate, and a degree of fluctuation depends on the numbers of observations. If there are a few observation opportunities, there would be anticipation of 100% nonoverlap. As the number of observations increase, there would be

much lower values of PND, but with equally probable evidence of an effect. As such, the PND measures can be informative, but only when the probabilities of values are known, and observations are numerous. Considering the current study PND results and a limited number of observations, the statistical decision-making accuracy for the participant cannot be determined with accuracy.

The one-point difference in the participant's SRS-2 pre-post test results demonstrate insignificance of the otherwise evidenced improvements in the target social skills. A T score of 73 post intervention places the participant in the moderate severity range of autism spectrum. It is also indicative of the fact that there are clinically significant deficiencies in the participant's reciprocal social skills that need to be addressed with an intense and targeted intervention. Because the overarching goal of SRS-2 is to identify severity of social impairment on the autism spectrum, it cannot be used to determine the potential gains in social skills after a brief training.

Context and Implication of Findings

Findings of this study have implications for research and practical applications in the field of behavior modification and social skill training for young children with ASD. The results support the effectiveness of BST in shaping desired behaviors.

Similarly to the current study, Peters and Thompson (2015) evaluated a BST training package with the use of role-playing, in-situ training, rehearsal, feedback, and reinforcement to teach social skills to young children with ASD. In contrast to the current study, the authors heavily relied on the parental involvement and feedback. The authors developed a questionnaire for parents of the participants that allowed parents to rate their child's ability to identify and respond appropriately during a conversation. To

enhance the study's relevance to the participants and ascertain their interests, Peters and Thompson interviewed the participants. As a result of the study, all participants demonstrated an increase in posing questions to an uninterested listener and changing topics, which were maintained during the follow-up phase. The overall results of Peters and Thompson's study as well as the current study expanded research on BST relative to teaching social skills to children with ASD. In contrast to the current study, the outcomes of the Peters and Thompson's study showed the importance of parental and participant involvement and relative ineffectiveness of teaching tacting, labeling, and the listener responding behavior in the social skills learning process.

Mahon et al. (2020) implemented a social skills training across three preschool teachers who taught preschool age children. Similarly to the current study, the social skills lessons incorporated the BST model. Moreover, the teacher participants engaged in learning about the appropriate replacement behaviors prior to implementation of the social skills in the natural environment. The study findings are informative and relevant to the current study outcomes in terms of the adult training and involvement as a potential agent of change. The results of Mahon and colleagues' study as well as the current study demonstrated effectiveness of the BST model in teaching adults and children, and improvements in social skills and on-task behaviors among young children.

Several other studies by Nuernberger et al. (2013) and Ryan et al. (2019) revealed the effectiveness of BST components into teaching social skills to adults with ASD. These findings further support the use of BST for teaching social skills across various age groups of individuals with ASD.

Spence (2003) stressed upon the use of discussions, behavior rehearsal, social

perception skills training, self-instruction, self-regulation techniques, social problem solving, and reduction of inappropriate social responses as potential target components of the social skills training that can be used to improve upon the traditional BST components.

Limitations of the Study

One central characteristic of single-subject research designs is an emphasis on one or a few participants (Ladford & Gast, 2018). While research into behavior modification of one participant is not an essential feature of the single-subject research methodology, it is an inherent methodological limitation that directly affects the generalization of findings to other individuals and settings.

Reactivity, as an effect of the researcher's ongoing observation in the training environment, might have potentially contributed to the participant's awareness of the researcher's presence and purpose. As such, positive changes to the participant's target behaviors might have been associated with the reactivity effect although the participant's young age and diagnostic characteristics counterbalance this suspected limitation.

The researcher engaged in selection bias by working with only one participant, who met the study's narrow inclusion criteria and anticipated positive changes in the participant's skill acquisition. This bias could have arisen from the researcher's preconceived notions, expectations, or personal investment in the participant's progress.

The nature of social skill training calls for deliberate teaching of generalization of skills and testing for generalization across various individuals, settings, and environments (Cooper et al., 2020). Several generalization probes of the learned target behaviors could have been measured to assess the participant's social skill acquisition.

A short intervention period is typically a limitation in research studies. While the researcher collected the intervention data across 14 days, individual social skill trainings and assessments were short and do not allow the researcher to evaluate the long-term effects of the intervention and capture meaningful results.

Future Research Directions

Future research efforts should build upon the findings of this study and incorporate generalization of social skill training across various environments and individuals with several young children with ASD of diverse backgrounds or groups of children with ASD who are affected by social skill deficits in the similar manner. A follow-up with participants at intervals beyond the initial maintenance phase could reveal any potential declines or continued improvements in social functioning over time. Researchers should consider the length of intervention to ensure that any observed changes or effects are sufficient for the research objectives.

Future research could investigate the impact that BST may have on young children with ASD during small group instruction on social skill training and generalization of the trained skills. Implementing BST to small groups of young children with ASD could decrease time constraints that naturally take place in the educational environments when incorporating a one-to-one approach, and increase the frequency and duration of the intervention, potentially improving the positive impact of BST on skill acquisition.

According to Maemonah et al. (2021), attention and instructional control are essential elements for language and social skills intervention strategies. As such, assessment of the child's attention should be included in future criteria for young

participants with ASD because capturing child's attention may ensure their focus on the intervention. Without child's full attention and instructional control, social skill intervention strategies can be ineffective.

By addressing the proposed research areas, a comprehensive understanding of the effectiveness, generalizability, and sustainability of BST interventions for improving social skills in children with similar diagnostic characteristics to Julian can be achieved. Future studies should aim to address the aforementioned limitations by including large and diverse participant sample, expanding upon the BST components, employing rigorous research designs, and considering the broader context of individual differences and environmental influences.

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Appendix A

Social Responsiveness Scale-2

wps

John N. Constantino, MD

Assessment ID _____

SRS™-2 AutoScore™ Form School-Age ○MALE ○FEMALE

INSTRUCTIONS

For each question, please darken the circle that best describes this child's behavior **over the past 6 months.**

Child's name _____ Child's age in years _____

Rater's name _____ Date of rating _____

Relationship to rated individual ☐ Mother ☐ Father ☐ Other custodial adult ☐ Teacher ☐ Other specialist

Grade _____ School or clinic _____

PLEASE PRESS HARD WHEN MARKING YOUR RESPONSES.

1 = NOT TRUE 2 = SOMETIMES TRUE 3 = OFTEN TRUE 4 = ALMOST ALWAYS TRUE

1.	Seems much more fidgety in social situations than when alone.	① ② ③ ④
2.	Expressions on his or her face don't match what he or she is saying.	① ② ③ ④
3.	Seems self-confident when interacting with others.	① ② ③ ④
4.	When under stress, he or she shows rigid or inflexible patterns of behavior that seem odd.	① ② ③ ④
5.	Doesn't recognize when others are trying to take advantage of him or her.	① ② ③ ④
6.	Would rather be alone than with others.	① ② ③ ④
7.	Is aware of what others are thinking or feeling.	① ② ③ ④
8.	Behaves in ways that seem strange or bizarre.	① ② ③ ④
9.	Clings to adults, seems too dependent on them.	① ② ③ ④
10.	Takes things too literally and doesn't get the real meaning of a conversation.	① ② ③ ④
11.	Has good self-confidence.	① ② ③ ④
12.	Is able to communicate his or her feelings to others.	① ② ③ ④
13.	Is awkward in turn-taking interactions with peers (for example, doesn't seem to understand the give-and-take of conversations).	① ② ③ ④
14.	Is not well coordinated.	① ② ③ ④
15.	Is able to understand the meaning of other people's tone of voice and facial expressions.	① ② ③ ④
16.	Avoids eye contact or has unusual eye contact.	① ② ③ ④
17.	Recognizes when something is unfair.	① ② ③ ④
18.	Has difficulty making friends, even when trying his or her best.	① ② ③ ④
19.	Gets frustrated trying to get ideas across in conversations.	① ② ③ ④
20.	Shows unusual sensory interests (for example, mouthing or spinning objects) or strange ways of playing with toys.	① ② ③ ④
21.	Is able to imitate others' actions.	① ② ③ ④
22.	Plays appropriately with children his or her age.	① ② ③ ④
23.	Does not join group activities unless told to do so.	① ② ③ ④
24.	Has more difficulty than other children with changes in his or her routine.	① ② ③ ④
25.	Doesn't seem to mind being out of step with or "not on the same wavelength" as others.	① ② ③ ④
26.	Offers comfort to others when they are sad.	① ② ③ ④
27.	Avoids starting social interactions with peers or adults.	① ② ③ ④
28.	Thinks or talks about the same thing over and over.	① ② ③ ④
29.	Is regarded by other children as odd or weird.	① ② ③ ④
30.	Becomes upset in a situation with lots of things going on.	① ② ③ ④
31.	Can't get his or her mind off something once he or she starts thinking about it.	① ② ③ ④
32.	Has good personal hygiene.	① ② ③ ④

Continue on back page

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W-608A

PLEASE PRESS HARD WHEN MARKING YOUR RESPONSES.

1 = NOT TRUE 2 = SOMETIMES TRUE 3 = OFTEN TRUE 4 = ALMOST ALWAYS TRUE

33. Is socially awkward, even when he or she is trying to be polite. ① ② ③ ④
34. Avoids people who want to be emotionally close to him or her. ① ② ③ ④
35. Has trouble keeping up with the flow of a normal conversation. ① ② ③ ④
36. Has difficulty relating to adults. ① ② ③ ④
37. Has difficulty relating to peers. ① ② ③ ④
38. Responds appropriately to mood changes in others (for example, when a friend's or playmate's mood changes from happy to sad). ① ② ③ ④
39. Has an unusually narrow range of interests. ① ② ③ ④
40. Is imaginative, good at pretending (without losing touch with reality). ① ② ③ ④
41. Wanders aimlessly from one activity to another. ① ② ③ ④
42. Seems overly sensitive to sounds, textures, or smells. ① ② ③ ④
43. Separates easily from caregivers. ① ② ③ ④
44. Doesn't understand how events relate to one another (cause and effect) the way other children his or her age do. ① ② ③ ④
45. Focuses his or her attention to where others are looking or listening. ① ② ③ ④
46. Has overly serious facial expressions. ① ② ③ ④
47. Is too silly or laughs inappropriately. ① ② ③ ④
48. Has a sense of humor, understands jokes. ① ② ③ ④
49. Does extremely well at a few tasks, but does not do as well at most other tasks. ① ② ③ ④
50. Has repetitive, odd behaviors such as hand flapping or rocking. ① ② ③ ④
51. Has difficulty answering questions directly and ends up talking around the subject. ① ② ③ ④
52. Knows when he or she is talking too loud or making too much noise. ① ② ③ ④
53. Talks to people with an unusual tone of voice (for example, talks like a robot or like he or she is giving a lecture). ① ② ③ ④
54. Seems to react to people as if they are objects. ① ② ③ ④
55. Knows when he or she is too close to someone or is invading someone's space. ① ② ③ ④
56. Walks in between two people who are talking. ① ② ③ ④
57. Gets teased a lot. ① ② ③ ④
58. Concentrates too much on parts of things rather than seeing the whole picture. For example, if asked to describe what happened in a story, he or she may talk only about the kind of clothes the characters were wearing. ① ② ③ ④
59. Is overly suspicious. ① ② ③ ④
60. Is emotionally distant, doesn't show his or her feelings. ① ② ③ ④
61. Is inflexible, has a hard time changing his or her mind. ① ② ③ ④
62. Gives unusual or illogical reasons for doing things. ① ② ③ ④
63. Touches others in an unusual way (for example, he or she may touch someone just to make contact and then walk away without saying anything). ① ② ③ ④
64. Is too tense in social settings. ① ② ③ ④
65. Stares or gazes off into space. ① ② ③ ④

Appendix B

Social Validity Survey

Social Validity Survey

Directions: *For each statement, please rate your level of agreement or disagreement relative to the recently completed BST by circling the following options as indicated below.*

1 - Strongly Disagree | 2 - Disagree | 3 - Neutral | 4 - Agree | 5 – Strongly Agree

No.	Skills	Level of Agreement				
1	The Behavioral Skills Training was an effective training to help my child learn social skills.	1	2	3	4	5
2	The overall Behavioral Skills Training effectively improved the accuracy of target social skills in my child in the training setting.	1	2	3	4	5
3	The Behavioral Skills Training model improved the accuracy of the target social skill in my child in the generalization setting.	1	2	3	4	5
4	I would recommend this training as well as techniques and approaches of social skills to others.	1	2	3	4	5

Appendix C

Task Analysis Sheet

Task Analysis: _____ Student Name: _____

	Steps	Date:		Date:	
		Score (1)	BTS Prompt Level (1)	Score (2)	BTS Prompt Level (1)
1		+ -	INST M T F IND	+ -	INST M T F IND
2		+ -	INST M T F IND	+ -	INST M T F IND
3		+ -	INST M T F IND	+ -	INST M T F IND
4		+ -	INST M T F IND	+ -	INST M T F IND
5		+ -	INST M T F IND	+ -	INST M T F IND
6		+ -	INST M T F IND	+ -	INST M T F IND
7		+ -	INST M T F IND	+ -	INST M T F IND
8		+ -	INST M T F IND	+ -	INST M T F IND
9		+ -	INST M T F IND	+ -	INST M T F IND
10		+ -	INST M T F IND	+ -	INST M T F IND

Instructions:

1. Write each step of the task in the "task" column.
2. Mark today's date above the score (1) column.
3. Mark the score (+/-) as each student completes each step and the prompt level in the columns marked (1).
4. Total the score by dividing the number of correct answers by the total number of steps (e.g. 8/10= 80%).
5. You can collect data on the same sheet for another trial under the columns marked (2).

Prompt Key (BST model):

INST= Instruction
M= Modeling
T= In-situ training for rehearsal
F= Feedback in the form of reinforcement
I= Independent

Appendix D

Behavioral Skills Training Guideline

Behavioral Skills Training Guideline

Instruction, modeling, in situ training, rehearsal/role-playing, feedback and reinforcement

Instruction:

- ▭ Name the skill.
- ▭ Describe the steps in the skill.
- ▭ Provide a rationale/example for using the skill (why we use it).
- ▭ Provide a non-example of when not to use the skill.

Modeling:

- ▭ Can use instructional videos.
- ▭ Can use in vivo modeling with two adults.

In situ/training:

- ▭ Have the learner engage in the instructions of the social skills in the contrived situation.

Rehearsal/ role-playing:

- ▭ Role-play the skills with other peers or instructors.

Feedback:

- ▭ Provide feedback on the rehearsal/role-playing of the skills

Reinforcement:

- ▭ Provide descriptive verbal praise.

Appendix E

Treatment Fidelity Checklist

Treatment Fidelity Checklist

Target	Training Date:	Initials
Greeted the participant appropriately	Y N	
Set up the materials appropriately	Y N	
Began the instructional phase	Y N	
Modeled the skill using role playing	Y N	
Trained the behavior using in-situ training	Y N	
Delivered feedback and delivered reinforcement	Y N	
Total Fidelity		

Appendix F

Interobserver Agreement Form

Task Analysis: _____ Student Name: _____
Therapist Name: _____ Researcher Name: _____

	Steps	Date:		Date:	
		Score (1)	BTS Prompt Level (1)	Score (2)	BTS Prompt Level (1)
1		+ -	INST M T F IND	+ -	INST M T F IND
2		+ -	INST M T F IND	+ -	INST M T F IND
3		+ -	INST M T F IND	+ -	INST M T F IND
4		+ -	INST M T F IND	+ -	INST M T F IND
5		+ -	INST M T F IND	+ -	INST M T F IND
6		+ -	INST M T F IND	+ -	INST M T F IND
7		+ -	INST M T F IND	+ -	INST M T F IND
8		+ -	INST M T F IND	+ -	INST M T F IND
9		+ -	INST M T F IND	+ -	INST M T F IND
10		+ -	INST M T F IND	+ -	INST M T F IND

# of correct steps implemented: ___/ 10

Instructions:

1. Write each step of the task in the "task" column.
2. Mark today's date above the score (1) column.
3. Mark the score (+/-) as each student completes each step and the prompt level in the columns marked (1).
4. Total the score by dividing the number of correct answers by the total number of steps (e.g. 8/10= 80%).
5. You can collect data on the same sheet for another trial under the columns marked (2).

Prompt Key (BST model):

INST= Instruction
M= Modeling
T= In-situ training for rehearsal
F= Feedback in the form of reinforcement
I= Independent