TEACHING PRELIMINARY SELF AWARENESS SKILLS TO A CHILD WITH ASD

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ABSTRACT

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Existing literature has underscored concerns regarding perspective-taking deficits in individuals with ASD, with limited success in achieving long-term effects and skill generalization through evidence-based interventions. This study investigated the extent to which preliminary self-awareness and perspective-taking skills can be taught to individuals with autism spectrum disorder (ASD) and the generalizability of these skills. The research design was a single-subject approach, specifically a multiple-baseline across behaviors design. The dependent variable, self-awareness, was quantified through the measurement of verbal behaviors, including specific, reciprocal, and correct verbal responses to instructional questions. The independent variable was the teaching intervention, which involved stimulus prompting, prompt fading, and positive reinforcement. This study sought to contribute to the research on teaching preliminary self-awareness and perspective-taking skills to individuals with ASD and aims to bridge existing gaps in knowledge and improve intervention strategies for this population, ultimately enhancing the quality of life for individuals with ASD and their families. The implications for this study are also discussed.

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CHAPTER I

INTRODUCTION

Statement of the Problem

The current study investigated the teachability of preliminary self-awareness and perspective-taking skills for individuals with autism spectrum disorder (ASD) through the application of an evidence-based instructional approach. Given that individuals with ASD often present areas for growth in these critical skills, and considering the existing gaps in the literature regarding generalizability of these skills, this research aimed to evaluate the effectiveness of a specific teaching procedure in enhancing these skills for individuals with ASD.

Purpose of the Study

The purpose of this study was to address perspective taking deficits in individuals with ASD and to increase the literature surrounding this topic. Children with ASD may lack perspective taking skills and generalization of those skills once taught. When engaging in perspective taking, a pivotal first step may be to have a concept of oneself. This study evaluated to what extent those skills can be expressed outside of the teaching context (generalized). This study aimed to increase the application of evidence-based practices for individuals with ASD through an evaluation of the chosen intervention for this study. Conducting this study may have proven to be beneficial for several fields including education, psychology, and applied behavior analysis. Furthermore, this study aimed to enhance and strengthen the positive outcomes for individuals with ASD and their families.

Variables

This project used a single-subject, multiple baselines across verbal behaviors design to evaluate the effectiveness of an intervention. Multiple baselines across verbal behaviors were measured. A tact-intraverbal was utilized using an intraverbal training method. Given that growth was made during the intervention phases, the individual was tasked with generalizing probes in a new setting. To demonstrate an acceptable response to the intervention, the expected verbal behavior increased during the intervention phase.

Significance of the Study

Previous studies highlight concern regarding perspective-taking deficits and skill generalization deficits in individuals with ASD. While many evidence-based interventions exist to address these deficits, the long-term effects of these interventions typically are not successful. This study aimed to increase the research surrounding the topic of teaching preliminary self-awareness and perspective taking skills to individuals with ASD, ensuring a focus on both initial teaching and generalization.

CHAPTER II

LITERATURE REVIEW

This literature review begins with the definition and prevalence of autism spectrum disorder (ASD), as well as common characteristics of ASD. It includes explanations of perspective taking as an important skill for those with ASD due to core deficits, the concept of theory of mind (TOM) and theory of mind deficits for those with ASD, and explanations of self and the role they have in perspective taking. The following sections describe applied behavior analysis and the concept of Skinner's theory of verbal behavior. intervention strategies are then discussed and include tact-intraverbal being taught using an intraverbal training method and its effectiveness for teaching preliminary self-awareness skills. Finally, the purpose of the current study is described.

Autism Spectrum Disorder (ASD)

Autism Spectrum Disorder is characterized as a neurodevelopmental disorder with impairments in social interactions and communication, behavioral challenges, and restricted behaviors that are often repetitive (American Psychological Association, 2013). These characteristics cause clinically significant impairments in social, occupational, and other important areas of functioning for those affected by the disorder. The presentation of symptoms can also vary widely. Accordingly, ASD is considered a spectrum disorder. Current statistics indicate that one in forty-four children are identified with ASD and that the disorder is four times more like to occur in males than females (CDC, 2022). Like many other developmental disorders, early intervention and identification are important for the best outcomes. An early diagnosis, between the ages of two and three, allows

families to have access to evidence-based interventions for their children that leads to more positive outcomes (Raches et al., 2019). As the prevalence rate of ASD continues to rise, so does the need for high quality evidence-based interventions (Schwartz et al., 2021).

Theory of Mind

Interpreting mental states of ourselves and others is a skill that is utilized frequently in typically developing individuals. This skill is commonly referred to as Theory of Mind (TOM) and is considered a branch of cognitive psychology. TOM, as it is referred to throughout the current study, is the ability to recognize and apply identifications of mental states like thoughts, feelings, and beliefs (Rosello et al., 2019). Individuals utilize these attributions to assign mental states to themselves and other persons in order to explain and predict the actions of other individuals (Jackson et al., 2014).

The current literature suggests that, among typically developing children, TOM develops gradually over time, especially during the preschool and toddler years between the ages of three and six (Lecheler et al., 2021). At age three, children begin to understand the concepts of desire, belief, and access to information (i.e., people have different wishes and beliefs, and not seeing the contents inside an item means not knowing). Between the ages of four and five, children begin to understand the concepts of false belief and hidden emotion (i.e., comprehending other's false beliefs and understanding that persons may feel a certain way but convey a different emotion). Finally, between ages six to twelve, children begin to understand the concepts of sarcasm, irony, and figurative speech (i.e., individuals indicate something that is different than

what was said; Rosello et al., 2019). Applying TOM skills to everyday situations is an important skill that develops at a young age and continues to develop as individuals grow older and encounter new stimuli and increasingly challenging situations (Huang et al., 2017)

Theory of Mind and Autism Spectrum Disorder

The concept of TOM and its relation to deficits in ASD is one of the most researched theories in the field of social cognition and perspective. This is largely due to the recognition that individuals with ASD have delayed or impaired TOM development (Fletcher-Watson et al., 2020). A widely accepted theory of this deficit is that the core symptoms of autism occur because of a deficient neuro-cognitive mechanism that deters the typical capability to develop a TOM (Frith et al., 1999). There is also preliminary evidence that suggests that the TOM-dedicated area located in the prefrontal cortex is not activated when individuals with ASD attempt TOM tasks whereas this area is activated in typically developing individuals (Rosello et al., 2020). This deficit manifests itself in skills like social communication, social-emotional behavior, and other cognitive abilities (Ahlers et al., 2017). Additionally, much of the literatures suggests that individuals with ASD tend to struggle on tests that involve the ability to understand other's mental states (Woodcock et al., 2019). Lastly, some with ASD exhibit impaired emotional processing, and have socio-communicative impairments that may affect overall functioning (Boucher, 2012).

This deficit continues to become more impactful as individuals with ASD grow older. This is because the varying demands of TOM challenges become more difficult with age and as the individuals encounter new situations and stimuli (Huggins et al.,

2021). These deficits make themselves more apparent in situations where social cues and contextual clues are present (Ahlers et al., 2019). With aging, the social cues become less predictable and ambiguous while verbal and nonverbal contextual clues are difficult to understand for those with ASD (Rosello et al., 2019). Some individuals may also not have the cognitive resources or processing abilities to carry out these tasks as well. These varying factors make TOM tasks especially challenging for those with ASD in comparison to those who are neurotypical.

TOM interventions and ASD

To address the TOM deficits that many individuals with ASD face, there is a variety of interventions available. A TOM intervention is a type of treatment that is explicitly based on the TOM cognitive model of ASD. Many of the intervention models target behavior management and personal skills training using a basic operant conditioning model (Fletcher-Watson et al., 2020). Other common TOM interventions have focused on addressing severe behavioral challenges and social communication challenges to address TOM deficits (Espinosa, 2021).

However, the majority of these types of interventions and the methodology incorporated for them have been ineffective in the long term (Hoddenbach et al., 2012). For the limited number of interventions that yielded successful results, the long-term effects of these interventions on the participants were not successful. It should also be noted that the IQ, social interaction style, severity of the disorder, and other comorbid disorders of the children undergoing these interventions may affect the results of these interventions as well (Hoddenbach et al., 2012). Individuals with ASD being able to learn

TOM skills, utilize these skills, and generalize them in everyday settings is a gap that exists in addressing this deficit.

Perspective Taking

Perspective taking is considered a highly important skill regarding TOM. Perspective taking is the ability to infer other person's mental states and using this information to interpret what may be said, make sense of behavior, and to make predictions (Peters et al., 2018). Given the similarities between TOM and perspective taking, perspective taking has mostly been studied using the framework of TOM (Hendriks et al., 2016). Like TOM, individuals with ASD typically have deficits with perspective taking. These deficits make themselves apparent in skills like social communication and general social functioning. For example, a child may not be able to predict or understand another person's behavior, or only acknowledge their point of view (Williams 2010). Some literature also suggests that this deficit in perspective taking may affect the ability to have empathy for others in a similar way in those who are neurotypical (Holopainen et al., 2019).

Relational Frame Theory

Behavior analysts look at the concept of perspective taking through the lens of relational frame theory (RFT). Relational frame theory is an area of behavior analysis that examines behavior with concerns to human language and cognition (Kavanagh et al., 2020). It is often considered an expansion of Skinner's *Verbal Behavior* theory because it accounts for both human language and external stimuli. In addition, RFT describes that perspective taking and other forms of cognitive functioning can be examined and measured by examining the interactions between a person and their environment

(Hendriks et al., 2016). RFT is the methodology included by behavior analysts to examine perspective taking challenges in those with ASD. Using this theory, interventions to build perspective taking have been developed. When conducting an initial assessment of this perspective taking ability, behavior analysts look for several perspective-taking skills. These skills are the level of accuracy, level of speed and processing time, and the complexity of the task itself (Hendriks et al., 2016). RFT helps with providing behavior analysis with a more in-depth view of behavior to address deficits in perspective taking.

Applied Behavior Analysis

Applied Behavior Analysis (ABA) is the science in which a multitude of approaches from the principles of behavior are applied systematically. Operant conditioning and other similar procedures are practiced in ABA (Fischer et al., 2019). The underlying goal of ABA is to improve socially significant behavior and determine the factors liable for contributing to that improvement (Cooper et al., 2019). ABA is commonly used to address and treat skill deficits in individuals with ASD through evidence-based methods in locations like schools, centers, and home-based therapy. ABA also incorporates data-based decision making, clinical expertise, and integration of client values with the goal of providing best practices (Slocum et al., 2014)

Verbal Behavior

The concept of self in behavioral terms is essentially a verbal response that occurs in various contexts that is conditioned by external stimuli. This aligns with B.F. Skinner's concept of verbal behavior in that behavior is shaped and maintained by mediated consequences (Skinner, 1957). Additionally, many modern-day practitioners contribute

current ABA practices to Skinner's theory of verbal behavior. Skinner also believed that stimuli elicit and evoke behavior, even verbal behavior. This idea led to the concept of operant conditioning which is a method that utilizes rewards and punishments to influence behavior. Skinner wanted to further advance the understanding of human language and how to modify it.

Modern ABA is based on Radical Behaviorism, pioneered by B. F. Skinner (Cooper et al., 2019). Among the many areas of behavior covered by Skinner's writing, verbal behavior has received special attention in the ABA research literature for children with ASD (Sautter & LeBlanc, 2006). In Skinner's theory of verbal behavior, Skinner described several verbal operants that are typically utilized to construct language repertoires for children with ASD (Johnson et al., 2016). The most common verbal operants are manding, echoic, intraverbal, tacting, and autoclitic. Manding is defined as requesting for something that is wanted or desirable to the individual and echoics are formed as an imitation of a natural sound that's heard by the individual (Johnson et al., 2016). An autoclitic frame is when an individual uses an adjective or adverb to request or label an item (Johnson et al., 2016). This type of verbal behavior is dependent upon other verbal behavior. Autoclitics are typically either mands (requesting) or tacts (identifying). Intraverbal-tacting is used when responding to questions pertaining to information about objects and people (e.g., "who are they?", "what are they doing?"; Degli-Espinosa et al., 2021). Tacting and understanding another person's perspective could be interpreted as tacting the variables that are controlling another's behavior. These skills develop naturally in typically developing children but can be delayed or impaired in children with ASD (Degli-Espinosa et al., 2021).

These skills develop naturally in typically developing children but can be delayed or impaired in children with ASD (Degli-Espinosa et al., 2021). These evidence-based procedures are commonly used to treat language deficits in children with ASD. The conceptualization and understanding of self that will be measured in this study is by verbal responses to certain stimuli in various conditions through tact-intraverbals using an autoclitic frame procedure.

Explanation of Self

When engaging in perspective taking, a pivotal first step may be to have a concept of oneself. In a behavior-analytic account, self can be broken down into multiple areas: bodily self, contextual self, volitional self, behavioral self, extended self, and interactional self. Contextual self is having the skill to discriminate the context, and controlling variables for ourselves and others (Hackenberg, 2022). This may be an important form of self for perspective taking. From an early age, we learn to identify our own behavior and we also learn the context behind it. For example, an individual may discriminate between being a student at school or a customer at a store. This also means being able to identify and understand the contextual selves of those around as well (e.g., teachers, nurses, grocery clerk, etc.). This skill requires individuals to recognize the context of situations they encounter and distinguish themselves apart from others (Hackenberg, 2022).

Teaching Procedure

Previous research has suggested that individuals with ASD have a lessened ability to discriminate the actions of themselves and other making perception more challenging (Williams et al., 2009). An intraverbal is a type of verbal response under control of a

verbal stimulus because of a history of reinforcement (Aguirre et al., 2016). Intraverbal control is seen in many behaviors like categorization, carrying on a conversation, songs, and fill-in-the-blank tasks (Ingvarsson et al., 2011). This teaching method may be beneficial for teaching preliminary self-awareness skills to individuals with ASD.

Purpose

This study sought to investigate the feasibility of teaching self-awareness skills to individuals with ASD who exhibit challenges in perspective taking, and furthermore, determine if these acquired skills can be effectively applied in different environments and the behavior subsequently generalized. In light of the current literature, which underscores the challenges faced by individuals with ASD in generalizing this skill across various contexts, notable challenges may arise. The gaps in the current body of scientific literature indicates concerns with generalizing these acquired skills and the teaching procedures that are utilized.

CHAPTER III

METHODOLOGY

Research Questions and Predictions

In this study, the following questions were addressed:

Research Question #1. Can preliminary self-awareness skills be taught to an individual with ASD using an intraverbal training method? It was hypothesized that a teaching procedure involving an intraverbal training method is effective for teaching preliminary self-awareness skills to individuals with ASD.

Research Question #2. Can established preliminary self-awareness skills taught to an individual with ASD be generalized in a natural environment, such as a classroom? It was hypothesized that established preliminary self-awareness skills can be taught to an individual with ASD and be generalized to a natural environment setting.

Research Design

A single-subject; specifically, a multiple-baseline across verbal behaviors design was used in the present study (i.e., *sister, student, friend*). Single subject research designs are an experimental approach to investigate a causal relationship between independent and dependent variables. Single-subject research design is a methodology that is typically used when evaluating the effectiveness of an intervention like in this study.

The dependent variable was self-awareness, quantified by measurement of relevant verbal behaviors, including specific, reciprocal, verbal responses related to the questions asked during instruction, and identified as correct. The chosen verbal behaviors for this study were *sister*, *student*, and *friend*. To be correct, a response needed to be verbal and correspond to the instruction, emitted within 5 seconds of the instruction. Some examples

include "who are you at home?" to which the individual would respond, "a sister", "who are you at the playground?", to which the individual would respond, "a friend", and "who are you at school?" to which the individual would respond, "a student".

The independent variable in this study was the teaching intervention that was implemented; specifically, use of stimulus prompting, prompt fading, and reinforcement. Prompt fading involves reducing and removing prompts involved with instruction over a series of trials and given that progress is being made. To strengthen the desired behaviors in intervention, positive reinforcement was provided. Positive reinforcement is a consequence that increases a behavior meaning that the behavior is likely to happen again.

In the first session of intervention, the instructor delivered the verbal antecedent (e.g., who are you at a friend's house?) and provided a verbal prompt of the verbal response (e.g., "a guest"). If the child emitted the correct response within two seconds, a token or other reinforcer was delivered. Prompts were given by the instructor when and if the child emitted an incorrect response. Reinforcement was not provided for incorrect responses.

Additional verbal behaviors were chosen once a participant was chosen and depended on the learner's specific needs. An interview was held with the participant's parents to determine what verbal behaviors they believed would be best. The participant's parents believed that the most relevant and beneficial verbal behaviors for their child were *sister*, *friend*, and *student*. Baseline sessions took place using baseline logic and were followed by intervention sessions until a mastery criterion was met. In this study, mastery criteria were defined as 80% independent correct responses across three

consecutive sessions. Interobserver agreement (IOA) data were collected for a minimum of 25% of total sessions. Total agreements were divided by the total number of intervals and multiplied by 100 to calculate the percentage of agreement. The individual who completed IOA data was trained in data analysis techniques and had a thorough understanding of IOA methodologies.

After mastery criteria was met, the participant was asked to complete generalization probes. Generalization probes took place in a different setting, the library. Generalization criteria were defined as 80% independent correct responses across three consecutive sessions.

Participant and Settings

This study sample included one 10-year-old girl named Sally (a pseudonym) diagnosed with ASD and a chromosomal disorder. Sally's forms of communication included oral language, sign language, gestures, and AAC. AAC was Sally's primary form of communication and her parents requested that she was taught the chosen verbal behaviors using her device. All assessment and intervention sessions occurred in the participant's home and then at the local library. The areas were free of potential distractions such as electronics or toys in both settings. No compensation was provided for participation in this study.

Protection of Human Rights

Participation in this study was voluntary and the participant could choose to withdraw from the study at any time. There were no consequences if participation from the study was withdrawn. Given the age of the child in this study, informed consent was given only by the parents. All information collected from this study was kept confidential

and stored securely. Any information that was collected that could identify the learner was not published or shared with anyone unless permission was given by the parents. Data were presented using an anonymous name, Sally, and any personal information relating to the child was not included in publications or presentations. This study also did not involve any potential risks to the learner. Sessions were short in duration and frequent breaks were provided as needed.

Materials

The quiet room in the participant's home included a table and two chairs. Paper data sheets and a writing utensil for data collection were present. Additionally, chosen materials for the intervention such as visual stimuli, tokens, and reinforcers were readily available as well. The chosen reinforcers during the intervention sessions were dependent on the participant. Reinforcers were items highly preferred by the participant or by an informal assessment (asking the participant what they would like to work for).

Procedures

IRB Approval. Approval for this study was obtained from the University of Dayton's Institutional Review Board prior to the onset of the study.

Baseline. Baseline data collection involved collecting responses of correct identifications of self-awareness through a verbal response. During baseline, the instructor presented the target question. The participant had 5 seconds to respond to the target question. If the learner responded correctly, the instructor provided a neutral response. If the learner responded incorrectly, the instructor did not provide any type of response and moved on to the next trial. No intervention was provided at this stage.

intervention began after the participant demonstrated low, stable responding, based on visual analysis of graphed data.

Intervention. Intervention data collection for this study began once baseline data were analyzed. Data collection during intervention was ongoing to determine if progress was being made from baseline and if mastery criteria had been met. Data collection took place over a two week period and sessions were less than five minutes in duration. Typically, sessions were completed in the morning and the afternoon. In this study, mastery criteria were defined as 80% independent correct responses across three consecutive sessions. During intervention, the instructor presented the target question and provided a model prompt. If the participant responded incorrectly, error correction was given. The instructor presented the target response again and provided a prompt. If the participant responded correctly, reinforcement was provided. The type of reinforcement to be provided was determined before the intervention session through an informal preference assessment and included items like token boards, edibles, games, and videos. Reinforcers were highly preferred by the participant as determined by caregiver feedback. The level of initial prompting depended on the learner's current skill level and progress. The instructor used most intrusive to least intrusive prompting, using a model prompt to evoke a correct response, beginning with a zero second time delay. Most-to-least prompting is a hierarchical method used to assist individuals in acquiring and demonstrating a desired behavior. It involves initially providing a more substantial level of assistance (most prompting) and gradually reducing the support until the individual can perform the behavior independently. To fade model prompts, a progressive time delay was used.

Generalization Probes. After mastery criteria was met, the participant completed generalization probes. Generalization probes measured the extent to which the learner could use the skill in a new context. This included practicing the skill in a new location, the library. Generalization criteria was defined as 80% independent correct responses across three consecutive sessions and three probes were completed for each target.

Data Collection

In this study, data on correct responses were tracked with paper and pencil recording. Correct responses were measured through trial-by-trial data collection, within 10-trial sessions. The percent of correct responses was calculated by dividing the number of trials correct by the number of total trials and multiplying by 100. Baseline sessions occurred, followed by intervention sessions, until mastery criteria was met. In this study, mastery criteria and generalization criteria were defined as at least 80% independent correct responses across three consecutive sessions.

Research Question 1

Can a teaching procedure involving an intraverbal training method be effective for teaching preliminary self-awareness skills to individuals with ASD?

<u>Hypothesis 1:</u> A teaching procedure involving an intraverbal training method is effective for teaching preliminary self-awareness skills to individuals with ASD and exceeding mastery criteria.

Research Question 2

Can preliminary self-awareness skills be taught to an individual with ASD and be generalized in a classroom setting?

<u>Hypothesis 2:</u> Preliminary self-awareness skills can be taught to an individual with ASD and be generalized in a different setting with at least 80% accuracy.

CHAPTER IV

RESULTS

Data Analyses

A visual analysis of the graphed data was conducted to assess intervention effectiveness. Level, trend, variability, immediacy of the effect, Tau U, and percent of non-overlapping data points (PND) were calculated and examined to determine the intervention's impact. The analysis involved a detailed examination of levels, trends, and variability, as well as assessing how quickly the intervention produced observable changes. Tau U provided a statistical measure of the relationship between the intervention and observed changes, while PND quantified the extent of change from baseline to intervention. The results were discussed to draw conclusions about the overall effectiveness of the intervention.

Research Question One

Can preliminary self-awareness skills be taught to an individual with ASD using an intraverbal training method? To answer research question one, the participant's baseline and intervention data were analyzed through visual analysis of graphed data (level, variability, and trend among baseline and intervention scores) to determine the intervention's effectiveness on preliminary self-awareness skills.



Figure 1. Sally's Percentage of Preliminary Self Awareness Skills

Table 1.	Statistical	Summary
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		Baselin	e	In	terventi	on	Γ	Difference	ce	Ta	u-U
	Level	Trend	SD	Level	Trend	SD	Level	Trend	SD	Effec t Size	P-Val ue
Sister	0	None	0	82	Upw ard	26.4	82	Yes	26.4	1	0.001
Frien d	0	None	0	93	Upw ard	4.7	93	Yes	4.7	1	0.001
Stude nt	0	None	0	93	Upw ard	4.7	93	Yes	4.7	1	0.003

Research Question One

Sister. The top panel of Figure 1 depicts baseline, intervention, and generalization phases for verbal behavior 1. Sally demonstrated an average frequency of 0 during baseline data collection for independent responses. For *sister*, the level for baseline was 0 and the level for intervention was 82. Five intervention sessions took place for Sally to meet mastery criteria. Independent responses increased by 82 percent from baseline to intervention. Trendlines (slope of the best fitting line within each phase) for both baselines and intervention phases were examined as well. During baseline, Sally's independent responses remained steady. During intervention, Sally's independent responses demonstrated a trendline with an upwards slope.

Immediacy of the effect compared the level, trend, and variability of the last three data points in the baseline phase to the first three data points in the intervention phase. During baseline, Sally's last three data points averaged 0% accuracy, and the first three data points averaged 73% accuracy. In summary, Sally performed more consistently and at a higher level during the intervention phase compared to the baseline phase. Thus, the intervention demonstrated an immediate effect.

Additionally, variability was analyzed by calculating the standard deviation amount, the baseline and intervention phases. For baseline, the standard deviation was 0. This demonstrates that every value collected from baseline was the same with no deviation. For intervention, the standard deviation was 26.4. This indicates that the data for the verbal behavior, *sister*, were more spread out and there was more variation. Calculation of the percentage or non-overlapping data (PND) was also completed by counting the proportion of data points that were more than the most extreme baseline data

points. As all 5 intervention points were higher than the baseline points of 0, the PND=5/5=100%. This suggests that the intervention was highly effective.

To further determine the magnitude of the effect, Tau-U was calculated as an effect size measure. The Tau-U calculation for sister was 1. This indicates a strong and positive relationship. The p-value for *sister* was 0.0016. This is highly statistically significant. This data suggests that the intervention was highly effective.

Friend. The middle panel of figure 1 depicts baseline, intervention, and generalization phases for the verbal behavior, *friend*. Sally demonstrated an average frequency of 0 during baseline data collection for independent responses. For *friend*, the level for baseline was 0 and the level for intervention was 93. Independent responses increased by 93 percent from baseline to intervention. Three intervention sessions took place for Sally to meet mastery criteria. Trendlines for both baselines and intervention phases were examined as well. During baseline, Sally's independent responses remained steady. During intervention, Sally's independent responses demonstrated a trendline with an upwards slope. Immediacy of the effect compared the level, trend, and variability of the last three data points in the baseline phase to the first three data points in the intervention phase. During baseline, Sally's last three data points in the consistently and at a higher level during the intervention phase compared to the baseline phase. Thus, the intervention demonstrated an immediate effect.

Additionally, variability was calculated by calculating the standard deviation amount the baseline and intervention phases. For baseline, the standard deviation was 0. This demonstrates that every value collected from baseline was the same with no

deviation. For intervention, the standard deviation was 4.7. This indicates little variation for the verbal behavior, friend. Calculation of the percentage or non-overlapping data (PND) was also completed by counting the proportion of data points that were more than the most extreme baseline data points. As all 5 intervention points were higher than the baseline points of 0, the PND=3/3=100%. This suggests that the intervention was highly effective.

To further determine the magnitude of the effect, Tau-U was calculated as an effect size measure. The Tau-U calculation for *friend* was 1. This indicates a strong and positive relationship. The p-value for *friend* was 0.001. This is highly statistically significant. This data suggests that the intervention was highly effective.

Student. The bottom panel of Figure 1 depicts baseline, intervention, and generalization phases for the verbal behavior, *student*. Sally demonstrated an average frequency of 0 during baseline data collection for independent responses. For *student*, the level for baseline was 0 and the level for intervention was 93. Independent responses increased by 93 percent from baseline to intervention. Three intervention sessions took place for Sally to meet mastery criteria. Trendlines for both baselines and intervention phases were examined as well. During baseline, Sally's independent responses remained steady. During intervention, Sally's independent responses demonstrated a trendline with an upwards slope.

Immediacy of the effect compared the level, trend, and variability of the last three data points in the baseline phase compared to the first three data points in the intervention phase. During baseline, Sally's last three data points averaged 0% accuracy, and the first three data points averaged 93% accuracy. In summary, Sally performed more consistently

and at a higher level during the intervention phase compared to the baseline phase. Thus, the intervention demonstrated an immediate effect.

Additionally, variability was calculated by calculating the standard deviation amount the baseline and intervention phases. For baseline, the standard deviation was 0. This demonstrates that every value collected from baseline was the same with no deviation. For intervention, the standard deviation was 4.7. This indicates little variation for target 3. Calculation of the percentage or non-overlapping data (PND) was also completed by counting the proportion of data points that were more than the most extreme baseline data points. As all 5 intervention points were higher than the baseline points of 0, the PND=5/5=100%. This suggests that the intervention was highly effective.

To further calculate the magnitude of the effect, Tau-U was calculated as an effect size measure. The Tau-U calculation for *student* was 1. This indicates a strong and positive relationship. The p-value for *student* was 0.003. This is highly statistically significant. These data suggest that the intervention was highly effective.

Research Question Two

Can established preliminary self-awareness skills taught to an individual with ASD be generalized in a natural environment, such as a classroom? To answer research question two, the participant's generalization data was analyzed by determining how many generalization probes were conducted before mastery criteria was met (80% Independent correct responses across three consecutive sessions).

Generalization

Sister. The third panel of figure 1 depicts the generalization phase for the verbal behavior, *sister*. Achieving the 80% mastery criteria for Sally required a process

involving three generalization probes in another setting, the public library. For the verbal behavior, *sister*, Sally's average generalization scores were 100%.

Friend. The third panel of figure 1 depicts the generalization phase for the verbal behavior, friend. The third panel of figure 1 depicts the generalization phase for the verbal behavior, friend. Achieving the 80% mastery criteria for Sally required a process involving three generalization probes in another setting, the public library. For the verbal behavior, *friend*, Sally's average generalization scores were 93%.

Student. The third panel of figure 1 depicts the generalization phase for the verbal behavior, *student*. Achieving the 80% mastery criteria for Sally required a process involving three generalization probes in another setting, the public library. For the verbal behavior, *student*, Sally's average generalization scores were 90%.

IOA Data Collection. IOA data were collected for all three verbal behaviors (sister, friend, and student). IOA data were completed for treatment integrity and agreed upon trials. Additionally, IOA data were completed by a trained individual through watching pre-recorded videos of baseline, intervention, and generalization sessions. IOA data for both treatment integrity and agreed upon trials was 100%.

CHAPTER V

DISCUSSION

Review of Purpose

The purpose of this study was to address perspective taking deficits in individuals with ASD and to add to the literature in this area. It is widely recognized that children with ASD often struggle with perspective-taking and the ability to generalize these learned skills (Welsh et al., 2019). Individuals with ASD often exhibit difficulties with perspective taking and self-awareness tasks due to neurotypical differences (Bertilsdotter et al., 2023). A fundamental prerequisite for successful perspective-taking is the development of a self-concept (Coutelle et al., 2020). This study aimed to assess the extent to which perspective-taking skills can be applied beyond the intervention teaching context and generalized. One 10-year-old girl diagnosed with both ASD and a chromosomal disorder participated in this study. The study took place in the child's home and the local library. The intervention occurred over a two-week period. Ultimately, the overall goal of this study was to enhance positive outcomes for individuals with ASD and their families by addressing perspective-taking deficits and facilitating more effective communication and social interactions.

Interpretation of Major Findings

Research Question One. *Can preliminary self-awareness skills be taught to an individual with ASD using an intraverbal training method?* The teaching method, consisting of an intraverbal training procedure combined with stimulus prompting, prompt fading, and reinforcement was successful in teaching preliminary self-awareness skills for Sally. Consistent with prior literature (Rodriguez et al, 2022), successful

intraverbal training was achieved using stimulus prompting, prompt fading, and reinforcement. Rodriguez et al (2022) focused on teaching children with ASD to identify stimuli, including a parallel research design with echoic (vocal) prompts. Reinforcements included toys, preferred edibles, and verbal praise, with mastery defined as two consecutive sessions at 100% correct responses. Results showed increased independent intraverbal tacts for participants. In our study, using similar procedures, IOA ranged from 99% to 100%, affirming the success of the teaching approach. Implications suggest the efficacy of intraverbal tact-based procedures, aligning with the findings of the current study.

Research Question Two. *Can established preliminary self-awareness skills taught to an individual with ASD be generalized in another setting?* Sally learned the targeted preliminary self-awareness skills and generalized the learned skills in a new environment with little difficulty. This differs from findings in some previous studies. Previous research has suggested that generalization of learned preliminary self-awareness skills typically isn't successful (Hoddenbach et al., 2012). Hoddenbach et al conducted a study evaluating the effectiveness of a theory of mind intervention for children with ASD. The research design was a randomized control trial that had two groups, an intervention group and a control group, one hundred participants total.

The intervention from the previously mentioned study consisted of a weekly cognitive behavioral group intervention that included eight sessions, were approximately one hour, and was provided to six children simultaneously. The weekly sessions consisted of discussing the homework assignment that was assigned previously, games and exercises related to the day's theme, children summarizing the sessions to their parents,

and an explanation of the next week's homework assignment. Several outcomes were generated. The general findings discovered that the taught theory of mind skills like understanding other's beliefs, false beliefs, mixed emotions, and complex emotions all improved. However, the generalization of the trained skills was not successful according to parent self-reports.

Unlike the previous mentioned study, the current study demonstrated successful generalization of skills taught in interventions. The implications of this suggest that the teaching method used in this study consisting of an intraverbal training procedure combined with the usage of stimulus prompting, prompt fading, and reinforcement were successful for teaching and generalizing preliminary self-awareness and perspective taking skills. Compared to previously utilized methods and interventions for teaching self-awareness and perspective taking skills, the method incorporated in this study demonstrated successful results.

Generalization

Generalization data collection took place at the local library in a quiet room with little distractions. Sally's responses to all verbal behaviors were primarily fluid and accurate. However, based on data collected, Sally had more difficulty with generalizing the verbal behavior, *student* (90%) compared to the verbal behavior 1, *sister* (100%) and the verbal behavior, *friend* (93%). The possible explanation for this is further explained in the limitations section. Overall, Sally demonstrated independence during generalization probes by being able to respond to questions pertaining to self-awareness that were learned in intervention.

Limitations

The first limitation identified in this study was the sample size of one participant. With a single participant, it is difficult to determine whether the results are representative of a broader population or the individual participant. Variability in characteristics, such as personality, cognitive abilities, and life experiences, can greatly influence the outcomes of the intervention, making it difficult to generalize the results to other individuals or groups. However, systematic generalization and direct generalization are concepts that describe how extending acquired knowledge can be applied to similar situations and contexts. Systematic generalization involves recognizing and applying underlying principles or rules systematically to new and similar scenarios. This approach is particularly valuable for understanding the predictability and reliability of knowledge transfer. In contrast, direct generalization focuses on the immediate application of learned skills for unrelated situations. Both systematic and direct generalization contribute significantly to understanding how individuals learn and apply knowledge in various settings, meaning the results and implications obtained from the learner in this study may be applicable to other learners as well.

Another limitation identified in this study concerns speech modality. One of Sally's primary forms of communication is through an augmentative and alternative communication (AAC) device, specifically language acquisition through motor planning (LAMP). LAMP provides individuals with limited verbal abilities a method of independently expressing themselves and communicating (LAMP, 2023). It is an approach that utilizes neurological processing and motor learning principles. Some icons require more or less motor movements than others. For example, the verbal behavior

sister and *friend* require two motor movements while verbal behavior 3, *student*, requires three motor movements. Speech modality encompasses a wide range of communication dynamics, and individual differences in speech production, comprehension, and modulation can be significant. Additionally, variability in speech patterns, language proficiency, and communication style were not adequately measured in this study given the single participant. This may make it difficult to generalize the findings of this study to a larger and more diverse group of individuals. To address these limitations and increase the findings, future research should consider involving larger and more diverse participant samples to better evaluate the effectiveness and generalizability of the intervention.

Another limitation in this study concerns generalization. The generalization data collection completed for this study was completed in a single day in one location. By restricting the study to a single participant, location, and day, the findings may not adequately capture the variability and complexity of real-world scenarios. A single-location, short-term study may not account for other variables, making it challenging to make conclusions about the intervention's effectiveness in diverse settings or over an extended duration. To enhance the external validity and applicability of intervention research, future studies should consider diversifying both the participant pool and the locations in which interventions are implemented. This would allow for a more comprehensive understanding of the intervention effects across various contexts and over extended time periods, providing a more accurate basis for making broader claims about the intervention's utility and effectiveness.

Lastly, another limitation identified in this study was a procedural error that took place during baseline for all three verbal behaviors. The multiple baseline design in this study required baseline probes to occur simultaneously. However, baseline probes for *student* were introduced one day later than the baseline probes for *friend* and *sister*. This is an error that was made early on, but it is not believed to have affected experimental control. Given that the participant demonstrated no change in behavior until intervention, experimental control was not affected.

Recommendations for Future Research

Future research should build upon the foundations of this intervention to expand understanding and scientific literature of teaching preliminary self-awareness skills to children with ASD and other developmental disabilities. One avenue for further investigation could involve exploring the long-term effects of the intervention on the child's self-awareness skills, collecting data over a more extended period to assess the success of generalization. Another avenue for further investigation could include a larger participant group as well.

Additionally, future research should include different age groups, different types of developmental disabilities, socio-economic backgrounds, speech modalities, and cultural settings. Furthermore, it would be beneficial to explore alternative modes of delivering the intervention, such as technology-assisted platforms or community-based programs, to assess their efficacy and accessibility. Extending the research beyond the initial intervention done in this study could create broader implications and applications of the acquired knowledge. Ultimately, this could potentially improve the lives and advance the skills of a more diverse range of children and their families.

Conclusion

A pivotal first step when engaging in perspective taking is having the concept of oneself. One area of self, contextual self, is having the skill to discriminate the context, and controlling variables for ourselves and others. From a young age, individuals learn to identify their own behavior as well as the context behind that behavior. This complex skill requires individuals to recognize the context of situations that they encounter and to be able to distinguish themselves apart from others and other contexts. Given that individuals with ASD have delayed or impaired development in this area, these skills need to be explicitly taught.

While evidence-based interventions exist to address preliminary self-awareness skill difficulties, generalization of these skills typically are not successful. This study was designed to address the gap that existed in the literature regarding individuals being able to successfully generalize self-awareness skills learned in intervention. The findings of this study suggest that the teaching method consisting of an intraverbal training procedure combined with stimulus prompting, prompt fading, and reinforcement were successful at teaching and generalizing preliminary self-awareness and perspective taking skills. Data from this study set the foundation for innovative interventions to address preliminary self-awareness and perspective taking difficulties in individuals with ASD and other developmental disabilities to enhance positive outcomes for these individuals and their families.

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APPENDIX A

Intervention Information

Environment: To minimize distractions start training in an empty room.

Materials: Data sheets, preferred reinforcers

Target Response: Engaging in the targeted response within 5 s of the instructor's instructions (e.g., responding independently after instructor will presents the target question.).

Baseline: The instructor will present the target question. Wait 5 s for the target response. If the child responds correctly within 5 s, give a neutral response. If no response, move on to next trial.

Procedures:

- Present the target instruction of the child.
- Use most-to-least prompting, using a model prompt to evoke a correct response, beginning with a 0-s time delay.
 - o To fade model prompts, a progressive time delay will be used, with the following hierarchy:
 - P1: 0-s delay
 - P2: 2-s delay
 - P3: 5-s delay
 - Independent: No prompt
 - o Move up the prompting hierarchy after every 5 trials with correct responding
 - E.g., After the child reliably follows the model prompt using a 0-s delay for 5 trials, move to a 2-s delay.
 - o If the child engages in an independent response, <u>before you are able to deliver the prompt for 2</u> <u>consecutive trials</u>, discontinue prompting, and reinforce independent responses only.
- If the child engages in a correct response at the prescribed prompt level, score the prompt required (e.g., **P3**).
- If the child engages in an incorrect response, score a and immediately implement error correction (see description below)
 - o If 2 consecutive incorrect responses are observed with the same exemplar, move back 1 prompt level.
- Once all prompts have been faded (i.e., the child is responding independently), highly preferred reinforcers should be discontinued for prompted responses (e.g., if you have to move back to a P3 after they have demonstrated independent responding due to 2 consecutive errors). At this point, provide praise only for prompted responses.

APPENDIX B

Consent Form

UNIVERSITY OF DAYTON

Parental Consent for Minor/Child to Participate in a Research Project

This will be nment.
in duration and
ssions will take
curely. Any t or shared with an anonymous publications or
ontact the chair 229-5527,

Student's Full Name (please print)

Parent's Full Name (please print)

Parent or Guardian Signature

Date

APPENDIX C

Intervention Adherence Checklist

- 2. Conduct an informal preference assessment with the participant. ____ (yes/no)
- 3. Provide the target question to the participant. 1____ (yes/no) 2____ (yes/no)

3____(yes/no) 4____(yes/no) 5____(yes/no) 6____(yes/no) 7____(yes/no)

- 8____ (yes/no) 9____ (yes/no) 10____ (yes/no)
- 4. If the participant responds incorrectly, provide error correction. Repeat the target question and provide a prompt. 1 (yes/no) 2 (yes/no) 3 (yes/no)
 4 (yes/no) 5 (yes/no) 6 (yes/no) 7 (yes/no) 8 (yes/no)
 9 (yes/no) 10 (yes/no)
- 5. If the participant responds correctly, provide reinforcement. 1 (yes/no) 2

(yes/no) 3____ (yes/no) 4____ (yes/no) 5____ (yes/no) 6____ (yes/no) 7____

(yes/no) 8____ (yes/no) 9____ (yes/no) 10____ (yes/no)

APPENDIX D

IOA Data Sheet for Treatment Integrity

Date	Session	Observer	Condition	# Steps Correct	#Total Steps	% Correct	TX inetgrity total average
8/5/23	1		Baseline	3	3	100	100%%
8/5/23	2		Baseline	3	3	100	
8/5/23	3		Baseline	3	3	100	
8/5/23	4		Baseline	3	3	100	
8/10/23	5		Baseline	3	3	100	
8/10/23	6		Intervention	5	5	100	
8/10/23	7		Intervention	5	5	100	
8/10/23	8		Intervention	5	5	100	
8/12/23	9		Generalization	5	5	100	
8/12/23	10		Generalization	5	5	100	

APPENDIX E

IOA Data Sheet for Agreed Trials

Session #	# Trials Agree	Total #Trials	IOA	Overall IOA Average
1	10	10	100	100
2	10	10	100	
3	10	10	100	
4	10	10	100	
5	10	10	100	
6	10	10	100	
7	10	10	100	
8	10	10	100	
9	10	10	100	
10	10	10	100	

APPENDIX F

Instructor Data Sheet

Session #			Circle	One:	Data		
Therapist			Primary	Reli	Date		
Target Question 1Con./P-LevelRecord prompt level used during each os, P2- 2s, P3- 5s, + (IND), - (ERROR)				ing each tr RROR)	ial: P		
Target Question 2Record prom 0s, P2- 2s, P3				ompt level used during each trial: P1 , P3- 5s, + (IND), - (ERROR)			
Target Question 3		Record pr Os, P2- 2s	ompt level , P3- 5s, +	l used duri (IND), - (EF	ing each tr RROR)	ial: P	