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TRAINING DEICTIC RELATIONS TO CHILDREN WITH DEVELOPMENTAL DELAYS THROUGH THE USE OF THE PEAK RELATIONAL TRAINING SYSTEM

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by

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TITLE: TRAINING DEICTIC RELATIONS TO CHILDREN WITH DEVELOPMENTAL DELAYS THROUGH THE USE OF THE PEAK RELATIONAL TRAINING SYSTEM

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Abstract

Children with developmental delays often do not acquire perspective taking skills without training. These skills are imperative to the ability to relate to others socially and the development of appropriate social behavior. They may lack the ability to recognize that another person's view may differ from their own, or that reality may differ from appearance. This study used deictic relational training to aid in the development of a 'Theory of Mind' and the acquisition of perspective taking skills. The PEAK relational training system was used in a special education classroom to train YOU and I relations, as well as YOU and I reversal, to two nine year old students with intellectual disability. Multiple exemplar training was then used to promote the generalization of these perspective taking skills to an in situ deceptive container task. One subject participated in the first two training phases, but was absent for the remainder of the study. The second subject successfully completed all training phases and was then able to correctly respond when asked to report what the perspective of another individual would be.

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CHAPTER 1

INTRODUCTION

Applied Behavior Analysis (ABA) has been shown to be effective at increasing skill acquisition and/or decreasing problem behavior in individuals with a variety of disabilities (Baer, Wolf, & Risley, 1968). Our past experience with treatment of disabilities has made apparent the importance of empirically supported treatment. Several "fad" treatments were introduced in the past, such as facilitated communication or chelation, and have since been shown to be disappointing at best, leading to false hope, and at worst, a possible danger to the client themselves, even deadly in some cases (Travers, Tincani, & Lang (2014) and National Institutes of Health). These treatments ultimately result in a waste of time and money that could have been applied to effective intervention. This outlines the importance of empirically supported, "evidence-based" interventions.

The aforementioned extreme prevalence of such disorders demands attention and creates a definite need in the scientific community to produce effective treatment options. It would be ideal for therapists and practitioners to have an array of treatment options to choose from; however, each and every one of them needs to be based on evidence that it has been shown to be an effective treatment. This helps to protect the individuals receiving treatment and safeguard the liability of practitioners, while strengthening the reputation of the field of Applied Behavior Analysis.

This is one of the strengths of ABA. Within ABA, there are many steps involved in creating a treatment plan. To promote skill acquisition, an assessment of the individual's current repertoire must be conducted to identify areas of need and an appropriate level at which to begin treatment. After the initial assessment, skills are selected and a training program is constructed

for each skill. A detailed task analysis should be written up for each component in the training program in the event that more than one person may be conducting treatment. Mastery criteria for each skill must be determined, and once mastered, these skills should be trained and/or tested for generalization. Periodically, responses should be documented and tracked for performance review. Similarly, overall skill acquisition should be tracked for progress review. In order to track both response data and skill acquisition, some form of data collection should be standardized for the individual's treatment program.

All of the above effort goes into the initial construction and implementation of each individual's treatment. With treatment often being implemented by teachers, aides, or caregivers without behavioral backgrounds, it is imperative that the mode of delivery be simple, with examples and clear instructions that are easy to follow to preserve the procedural integrity of treatment. Recently, a program has been designed that simplifies this otherwise complex process and is beginning to be disseminated to the applied community. The PEAK relational training system was built off of evidence-based practices and the acronym stands for "Promoting the Emergence of Advanced Knowledge" (Dixon, 2014a).

To date, there is no other system available like the PEAK. The system contains the full circle of treatment design and preparation, implementation, and monitoring; including an initial brief overview to assist in stimuli selection, reinforcer selection, and familiarizing oneself with the program. This could help to simplify things, explaining them for those individuals without a behavior analytic background who wish to implement treatment, such as caregivers. This all-inclusive system packages everything else needed to implement a skill acquisition program that also has the added benefit of growing with the learner, because as they acquire skills, the next skills to be targeted have already been identified. The program begins with a predesigned

assessment of skills which are already arranged in hierarchical order of their level of functioning. Completion of the assessment also produces a graphic pyramid for visual representation of current skill level. This assessment charts skills already in the individual's repertoire and identifies not just the immediate skills to be learned, but also higher skills to be rotated in as other skills are mastered. Data sheets are included and organized for use, along with a clear description of the response documentation process. Each skill has a program instruction sheet included in the curriculum which has clear and concise instructions and examples to help maintain consistency across multiple therapists/implementers. There is even a progress report form included at the end.

The introduction of the PEAK system has offered therapists, practitioners, teachers, and even parents access to a full package skills assessment and acquisition treatment system (Dixon, 2014a). The tool is specifically useful for organizing and conducting ABA services in the classroom, where multiple students may each have several target skills to address simultaneously. With the number of children needing services on the rise, there is an increasing demand to meet individual needs while making services available to all those who demonstrate significant skill deficits.

It is estimated that 1 in 68 children has been identified as having a form of autism spectrum disorder (ASD), according to the Center for Disease Control's Autism and Developmental Disabilities Monitoring (ADDM) Network. All racial, ethnic, and socioeconomic groups have been affected by this disorder (Baio, 2014). ASD is just one of many disabilities that lead to a need for skill acquisition training. There is a wide range of disorders children may suffer from, including ASD, Attention Deficit/Hyperactivity Disorder (ADHD), Cerebral Palsy, Down Syndrome, Emotional Disturbance, Oppositional Defiance

Disorder, Learning Disabilities, Intellectual Disability, and Speech and Language Impairments, to name just a few (Center for the Improvement of Child Caring). Each of these disorders may bring with it its' own combination of special needs. Developmental delays are a common concern for each of them.

Individuals with developmental delays may be prone to a deficit in perspective taking skills. This specific deficit is the inability to take the perspective of another person and comprehend that some people think differently than others, and all individuals are not aware of the same facts and details. Inaccurate perceptions, also known as 'false beliefs', can be suggested using a deceptive container, as relational responding is influenced by contextual cues (Barnes-Holmes, McHugh, & Barnes-Holmes, 2004). An example of this would be if someone were shown a cookie jar, they would be likely to suspect there may be cookies inside. Similarly, if presented with a piggy bank, they would likely believe there may be money or coins inside. These assumptions are initial beliefs that were derived from certain contextual cues. In the case of the Smarties task developed by Perner, Frith, Leslie, & Leekam, (1989), the container was labeled with a brand of candy, which led children to believe there was candy inside, even though the container truly contained pencils.

Past literature has approached perspective taking skills from a 'Theory of Mind' paradigm (Howlin, Baron-Cohen, & Hadwin, 1999). According to Colle, Baron-Cohen, and Hill (2006), a theory of mind can be defined as the understanding that what a person believes or feels may differ from what is real. It is through the theory of mind that an individual can make inferences regarding the beliefs, interpretations, and viewpoint of another person in a specific context. The ability to take another's perspective helps one individual relate to another and understand or predict their feelings and/or actions. This process is referred to as perspective

taking and involves the deictic frames of I-You, Now-Then, and Here-There (Hayes, Barnes-Holmes, & Roche, 2001). Impairment in the development of theory of mind thus leaves one with inabilities in this area (Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997). Without developing a theory of mind, many of the social deficits often associated with autism and similar disorders may emerge, such as asocial behavior and poor social skills, taking the form of a lack of affective or reciprocal interactions (Rehfeldt & Barnes-Holmes, 2009).

The effects of a history of reinforcement of relational responding on perspective taking skills have been investigated previously by Rehfeldt, Dillen, Ziomek, and Kowalchuk (2007). Their research found that reinforcement of responding helped to improve performance on assessment tasks for perspective taking skills. The researchers also suggest that this training may generalize to other perspective taking tasks.

In 2011, a similar study by Weil, Hayes, and Capurro investigated shaping deictic relational frames as operant behavior in typically developing children, ages four and five. They found that as children began to take on accurate deictic relational responding for reversed and double-reversed relations, their ability to correctly respond to other perspective-taking assessments concurrently increased. Weil et al., (2011) began by presenting their participants with pre-instructional probes meant to assess the children's perspective taking skills across all three levels of complexity for a total of 18 trials. The levels of complexity were listed as simple, reverse, and double-reversed. Then the children began their relational training which consisted of 12 trials of deictic frames with the complexity level randomized for each child, except for two of the children who were trained with a specific order. Each trial resulted in either reinforcement or corrective feedback depending on accuracy. Relational training trials were followed by the use of post-instructional probes. These were adjusted based on the child's individual

performance during the relational training phase, but were otherwise the same as the pre-instructional probes. Post-instructional probes revealed that all three children showed improvements across all three levels of complexity.

O'Nions, Sebastian, McCrory, Chantiluke, Happé, and Viding (2014), conducted a study evaluating the neural processing associated with "theory of mind", contrasting children with conduct problems and callous, unemotional traits to children with ASD. The authors report that atypical neural processing associated with theory of mind was only observed in children with ASD. This is of particular significance, as this paradigm plays a crucial role in deriving the relations necessary for the development of social components, such as empathy and perspective taking, which in turn lead to the ability to discriminate between appropriate and inappropriate social behavior (Rehfeldt, Dillen, & Ziomek, 2007; Weil et al., 2011).

The purpose of the present study was to train deictic relational responding and perspective taking skills to children with developmental delays utilizing the PEAK curriculum, and to assess the generalization of this skill to a 'Theory of Mind' task. In addition, this study sought to add to the base of evidence for the efficacy of the PEAK system as a treatment package for use in applied settings, such as the special education system.

CHAPTER 2

METHODS

Participants and Setting

Two students with cognitive delays were selected for participation in the study from a Midwestern American school. All other students in the special education program at this school were assessed, but did not meet criteria to participate because they either already possessed the skills to complete the task correctly, or they did not have the prerequisite verbal skills required for such advanced programs. Participation criteria was in place so that the PEAK skills assessment identified deficits in the understanding of deictic relations, indicative that the skills were absent in the student's existing repertoire. Additionally, students were presented with a test scenario designed to assess their ability, or lack thereof, to use deictic relations to generate the appropriate response to a 'theory of mind' task, which required the subject to consider the view from someone else's perspective and involved the idea of 'false beliefs'. The task presented was based off of the "Smarties task" developed by Perner, and colleagues, (1989). The original task involved the use of a candy container to demonstrate false beliefs to children by replacing the candy inside with pencils. The candy container was shown to the children and they were asked what they believed was inside. After responding that they believed it contained "candy" or "sweets", the children were shown the true contents (Perner, et al., 1989). This demonstrated to them that reality may differ from appearance or initial belief. Following this revelation, the children were then asked what they thought a third party person who was not present when the contents were revealed might think is inside the container in an attempt to demonstrate how the knowledge of reality, as it differs from appearance, may not be shared knowledge. For the

purpose of the present study, a similar deceptive container task was designed using a Crayola crayon box. The crayons were removed and replaced with small plastic zoo animals.

The two participating subjects were Macy, a nine year-old girl in fourth grade, with a diagnosis of intellectual disability, and Adam, an nine year-old boy in fourth grade, also with a diagnosis of intellectual disability. All sessions were conducted in a classroom that the participant regularly attends. Either a separate working area, sectioned off with a cubicle divider to lessen distractions from the rest of the classroom and to minimize any distraction to the classroom caused by the sessions, or when available, a vacant classroom next door to the participants' classroom was used. Sessions took place at a table with two or three chairs, and were conducted by researchers who have conducted ABA sessions of this kind in the past. Sessions ran from 20-minutes to 1-hour and were conducted at times of convenience, as identified by the classroom teachers, for three weeks.

Materials

For the modified Smarties task, a common Crayola crayon box was used, with the crayons removed. A variety of miniature plastic zoo animal toys replaced the crayons as the contents in the box. When the box was presented, a short script was followed to ensure that interactions across participants were held consistent (see Appendix A).

The PEAK relational training system supplied the assessment forms, program task analyses, and data sheets for all sessions (see Appendices B, C, D, and E). Assessments were conducted following the PEAK instructions, in cooperation with the classroom teacher. Additional materials consisted of writing utensils for data collection, and visual stimuli for presentation, which were supplied following the PEAK instructions for program implementation on the program sheets.

All visual stimuli were simple 'clip-art' black and white images of common items that the subjects would be likely to identify easily. For both programs 12A and 12B, training stimuli were images designated as stimuli "A" and stimuli "B" (see Appendix F). The "A" stimuli included pictures of a boat, an airplane, and balloons. The "B" stimuli included pictures of a bunny, a flower, and an ice-cream cone. Stimuli sets were arranged so that each "A" stimulus image was paired with each of the "B" stimulus images, with a total of nine sets of training stimuli pairings, which can be seen in *Table 1*. During each training block of ten trials, each stimulus pairing appeared once, in varying orders. To decide the order of presentation, the stack of stimuli pairings was simply shuffled. One of the stimulus pairings was chosen at random (pulled from the center of the stack) and presented for the tenth trial in each block. For program 12B, the training trials were conducted the same as for 12A, however, the test trials were conducted in the same manner, but with novel stimuli. Stimulus pairings were "C" and "D" stimuli, in place of "A" and "B" pairings (see Appendix G). The "C" stimuli were composed of images of an apple, a ball, and a cat. The "D" stimuli consisted of images of a tree, a shoe, and a car. Stimuli sets were arranged so that each "C" stimulus image was paired with each of the "D" stimulus images, resulting in nine sets of training stimuli pairings (see *Table 1*). The order of stimuli pairing presentation was elected in the same manner as before, shuffling the stack before each trial block.

Finally, in the deceptive container phase, the container stimuli used were a 'trick-or-treat' pumpkin bucket, a shoebox, and a lunchbox. Stimuli used for contents were socks, crayons, and a toothbrush. The container and contents stimulus pairings can be seen in *Table 2*. A small stuffed toy doll was used as the character for the scenario in each trial. Dolls were either Olaf the snowman or Spiderman.

Reinforcers were selected based off of teacher recommendations and subject choice. The classroom teacher identified Skittles, small bits of chocolate, and Cheez-It crackers as highly preferred edible reinforcers for the subjects. Based off of the teacher's recommendation, subjects were given the option at the beginning of each session to choose which item they would like to work for, out of an array of Skittles, Cheez-It crackers, and KitKat minis. Macy chose KitKat minis for all sessions. Adam chose Skittles for most sessions, but chose Cheez-It crackers for some sessions.

Dependent Variables and Interobserver Agreement

Participant's PEAK scores, as generated by completion of the data sheet, were monitored for progress. Each trial was rated on a likert scale, including "0" for no response or failure to emit the correct response after multiple prompts, "2", "4", and "8" for differing levels of required prompting ("2" requiring several prompts and "8" requiring only one prompt), and a score of "10" for correct responses without prompting. Each block of 10 trials was converted into a percentage, so that a total PEAK score of 78 was equal to 78%. Mastery criteria were set as obtaining PEAK scores of at least 90 (90% or higher) for three consecutive trial blocks. To test for generalization and maintenance, test probes were given intermittently, resulting in scores of either "0" for an incorrect response or "10" for a correct response requiring no prompting.

Interobserver agreement (IOA) data were collected on 28% of all trials by a teacher's aide from the classroom that had extensive prior experience conducting PEAK sessions with the subjects over the last two years. No additional training was given to the aide prior to sessions. The two independent observers scored trials and IOA was calculated as the percentage of agreement between the two scores. Agreement was defined as both independent observers recording the same score for an individual trial. The number of trials in agreement was divided

by the total number of trials (agreement and disagreement) in which IOA was collected, and then multiplied by 100 to result in 92% percent agreement.

Design and Procedure

A within-participant multiple-probe across tasks design was employed. Tasks consisted of the modified Smarties deceptive container probe and two program modules included in the PEAK curriculum for the perspective taking skill. The specific modules were 12A *Perspective Taking: You and I,* and 12B *Perspective Taking: You and I Reversal* and are based on the I/YOU frame of deictic relations. Protocol for trainings was conducted according to the included task analysis the curriculum supplies for each program (see Appendices C and D). During the lower level complexity program, the participant was shown a piece of paper with different images on each side. The paper was held upright between the researcher and the participant. The participant was asked to describe who sees which image, the participant or the researcher, using the terms "You" and "I". For example, the researcher would ask "Who sees an airplane?" Participant responses were either "I do" or "You do". During the higher level complexity program, the paper with different images on each side was held up between the participant and researcher, but participants were now asked to reverse perspectives and state which person sees which image. For example, "If I was you and you were me, what would you see?" The correct response would be the image that was facing the researcher. And "If I was you and you were me, what would I see?" The correct response for this question would be the image facing the participant. This demonstrates the ability to put oneself in the position of another and imagine what the view from their perspective would be.

An initial modified Smarties task probe was given following the script. Then the lowest level program for deictic relations, 12A, was implemented first until mastery criteria were

achieved. After completion of program 12A, the modified Smarties task was once again administered to probe for acquisition of the perspective taking skill and its generalization to understanding false beliefs. Then the participant proceeded to training for the higher level program for deictic relations, program 12B. Following the training phase of program 12B, the modified Smarties probe was administered again. Next, participants entered the testing phase for program 12B, followed by another modified Smarties probe.

In the fourth phase, multiple exemplar training was conducted with the deceptive containers. In each trial, a doll (either Spiderman or Olaf the snowman) was used as a third person character. The Halloween treat bucket was shown and the participant was asked what they believed was inside. After making their guess, the doll was put under the table. With the doll gone, the researcher revealed "a secret" to the participant that there were really socks inside of the treat bucket. Then the Spiderman doll was brought back to the top of the table and the participant was asked "What does Spiderman think is in the treat bucket?" A response of "treats" or "candy" was considered correct and was reinforced with praise and the edible reinforcer of choice. If the participant answered incorrectly (that Spiderman would think there were socks in the bucket), the researcher would restate the question and prompt the appropriate response as follows: "Spiderman was under the table. He wasn't here when we looked inside. What will he think is in the treat bucket?" Trial blocks were given and scored following the PEAK protocol, the same as for programs 12A and 12B.

CHAPTER 3

RESULTS

Prior to training, both participants were given the modified Smarties task probe to assess their current ability to complete a perspective taking task, and both participants failed to adequately demonstrate the skill during this initial probe. Participant 1, Adam, failed to complete the second component of the task in which he was required to answer what his teacher would think was in the crayon box if it was presented to her. After this initial assessment, training began on program 12A. During these training blocks he obtained PEAK scores of 90, 88, 100, 100, and 100, consecutively (see *Figure 1*). He reached mastery criteria in only five trial blocks. After achieving mastery of program 12A, the modified Smarties task probe was administered a second time and Adam was once again unable to complete the second component of this task, answering incorrectly when asked what his teacher would see. After this second probe, training for program 12B began. Program 12B required nine trial blocks (90 trials) for Adam to reach mastery criteria. Prior to conducting test trials for 12B, the modified Smarties task probe was given for the third time. At this point in the training Adam was once again unable to complete the modified Smarties task, still unable to appropriately answer from the perspective of his teacher. Test trial blocks were then conducted with no prompts and mastery criteria were reached in the first three trial blocks, with scores of 90, 100, and 100. A final modified Smarties task probe was conducted after the completion of the test trails, and Adam failed to correctly respond once more.

Multiple exemplar training for the deceptive container program was then initiated with Adam ("DC" phase in *Figure 1*). He reached mastery criteria on the seventh trial, with scores ranging from a low of 68 on his first trial, to the highest possible score of 100 on his final trial.

Modified Smarties task probes were interspersed with training to test, without prompting, for skill acquisition. Adam was unable to respond correctly to the first probe after training had begun, but did successfully pass the second probe, which corresponded to his reaching a performance score of 96. After three more trials (scoring 96, 100, and 100), a final modified Smarties probe was administered and Adam again responded correctly.

Participant 2, Macy, also failed the initial modified Smarties task probe prior to training, being unable to accurately state what her teacher would think was in the box if it were presented to her. After this baseline assessment, training began on program 12A, where she obtained PEAK scores of 88, 90, 96, and 98, consecutively (see *Figure 2*). Macy was able to reach mastery criteria in only four trial blocks, one less than Adam. After completion of her 12A training, the modified Smarties task probe was administered a second time. Macy was able to successfully complete the second presentation of the task by responding that the third party person, her teacher, would think there were crayons inside the crayon box. Training for program 12B began immediately after this probe, and Macy's performance improved from her initial trial block score of 40 to a high score of 80; however, she was unable to reach mastery criteria at any point during her training. After conducting 19 trial blocks, which includes 190 individual trials, Macy was given the modified Smarties task probe a third time. During this presentation, she was unable to respond correctly when asked what her teacher would think was in the box when it was presented. During each training trial, Macy was asked one of two questions. The correct response would be either the image in front of her, or the image on the other side of the paper, viewable only to the researcher. Macy demonstrated a tendency to answer incorrectly when the correct image was not within her view. When the correct answer was viewable only to the researcher, prompting was often required to evoke a response.

Occasionally Macy would respond by naming an image that had not been presented during that training trial. For example, if the images presented were an airplane and a flower, Macy might have answered "balloons." This behavior was only observed during trials in which the correct response was the image not visible to Macy. In light of this, the researcher began to suspect that Macy may have been experiencing difficulty remembering which images were presented during the trial. To further explore this possibility, although mastery criteria had not yet been reached, three test trial blocks were then conducted in order to assess how Macy would respond when no prompts were provided. During each block of ten trials, five trials were presented in which Macy was required to respond by naming the image in front of herself and five trials required her to respond with the image in front of the researcher. The test trials resulted in scores of 60, 70, and 70. In each of the three trial blocks, Macy was able to score 50 out of 50 points for the trials when the image in front of her was the correct answer. Upon completion of the 12B test trials, a final modified Smarties task probe was then conducted with Macy, and once again she failed to adequately demonstrate the ability to accurately take the perspective of her teacher.

Macy was absent from school during the final week of data collection and therefore never entered training in the final phase with multiple exemplars for the deceptive container task due to her absence.

CHAPTER 4

DISCUSSION

The initial modified Smarties task probe stood to serve as an evaluation of whether or not the subject was able to consider the perspective of another individual, being aware of what that person may likely know or not know. It was expected that the skill acquisition from the I/YOU reversal perspective taking program would give the subjects the ability to complete the task. However, in light of the results, the subjects were not able to give a correct response consistently after only being trained on 12A (I/YOU) and 12B (I/YOU reversal). This indicates that correct responding for the modified Smarties task may require not only the I/YOU frame that is learned with the perspective taking: I/YOU reversal program, but may additionally require the HERE/THERE frame, as well as the NOW/THEN frame. Therefore, two of the three components required for this Theory of Mind task were missing from their training. Since this task was based on the concept of false beliefs, understanding that the other person was not likely to know that the contents of the box had changed from their original state (crayon boxes typically come with crayons inside) requires the subject to consider not only what that person sees in front of them, but also to consider that the other person was not present (HERE/THERE) when the true contents were revealed (NOW/THEN).

It is possible the subjects may also have expected that the other person had been present when the animals were put into the box, as this was not done in front of the subject. In future studies, the box could initially contain crayons, as expected. Then the researcher would remove the crayons and replace them with unexpected items in front of the subject privately, and then probe the question about what the non-present person would think was in the box.The PEAK programs 12A and 12B did effectively teach the perspective taking skill for the image task.

Evidence to support this can be seen in the fact that participants were able to demonstrate perspective taking skills after program training. The issue is not that training was ineffective, but rather training was incomplete. I/YOU reversal is one part of perspective taking, but understanding false beliefs requires other skills as well.

At this point, multiple exemplar training was implemented with Adam. As soon as his performance reached mastery level scores, he was able to successfully complete the modified Smarties task. Unfortunately, Macy's absenteeism prevented her from entering the final phase by the time of this writing. Efforts will continue to be made to work with Macy in the future to allow her the opportunity to acquire the skills through the deceptive container task training provided in the final phase. Attrition due to Macy's limited participation is likely the most profound limitation in this study.

A possible confound observed during the PEAK program 12B sessions was that Macy exhibited apparent difficulty with the task due to the removal of the stimulus image and the delay in the target question provided by the researcher. There were many trials during which Macy would be asked "If I was you and you were me, what would you see?" and she would respond by shrugging her shoulders and saying "I don't know, I don't remember what it was." This indicates she may have known that the correct answer was the image viewable on the researcher's side of the paper, but by the time the question was asked, she simply did not remember what the other image was. This revealed that her responding behavior was not under programmed stimulus control and could be a product of her disability. This is also supported by the fact that when the question was posed "If I was you and you were me, what would I see?", Macy was able to give the correct response, which correlated to the image visible in front of her. To provide further support for the role of a memory deficit in her difficulty completing the task,

researchers could assess her memory, after an incorrect response, researchers could question what image is on the other side of the card. This would add verification that Macy in fact did not recall which image was included on this trial, opposite her view.

This possible skill deficit may have significantly impacted her PEAK scores, inhibiting her from reaching mastery criteria on the I/YOU reversal perspective taking program. In this situation, a program modification may have been a necessary accommodation to meet the particular need of this learner. If future studies should encounter a similar difficulty, researchers should consider modifying PEAK programs to reduce the impact that the removal of the stimulus image and the delay in the researcher's target question have on responding. Future researchers should investigate the impact on responding due to a delay between the presentation of the visual stimulus and the opportunity to respond to the researcher's question. One possible method would be to start with a 0-second delay, with both images being displayed concurrently followed by the immediate presentation of the question, and then increase the delay of the question presentation by a few seconds each time a new trial block is introduced. It may also be beneficial to work with the individual at varying delays throughout their training.

Another technique that could be used to address these issues would be to have the participant and the researcher seated side by side. Stimuli could then be presented by placing one image in the hand of the participant, and the other image in the hand of the researcher, thus keeping both images concurrently viewable. Then the wording in the question could be modified to ask “If I was you and you were me, what picture would you be holding?” The participant would then be able to view both response options and select their answer from the two. Another possible accommodation that would not require seating or presentation modifications would be simply to offer the two options verbally after each question. For example, “If I was you and you

were me, what would you see… a bunny or a flower?" This would cue the learner to select from the two choice options. If they are aware that the correct answer would be the image on the other side of the paper, and one of those two options was the picture they were viewing, they could then deduce that the image on the researcher's side of the paper must be the other choice option. These minor modifications could greatly impact a learner's documented performance on programs and are relatively simply to implement.

Table 1

Stimulus Classes by Stimulus Pairings

Stimulus Pairings				
Class	**A**	**B**	**C**	**D**
1	sailboat	plane	apple	shoe
2	flower	balloons	cat	car
3	bunny	ice cream	ball	tree
4	sailboat	balloons	apple	car
5	flower	ice cream	cat	tree
6	bunny	plane	ball	shoe
7	sailboat	ice cream	apple	tree
8	flower	plane	cat	shoe
9	bunny	balloons	ball	car

Table 2

Table displaying the various stimulus pairings used by the deceptive container task.

Deceptive Container Task Stimuli sets	
Container	**Contents**
Shoe box	Crayons
Lunch box	Toothbrush
Trick-or-treat Bucket	Socks

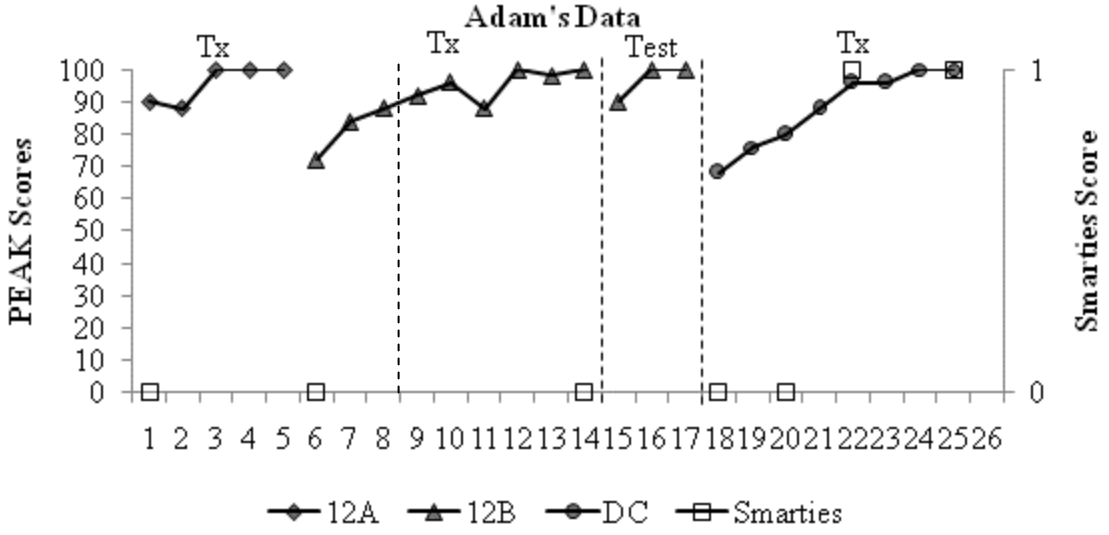

Figure 1. Graph representing Adam's performance across tasks and activities.

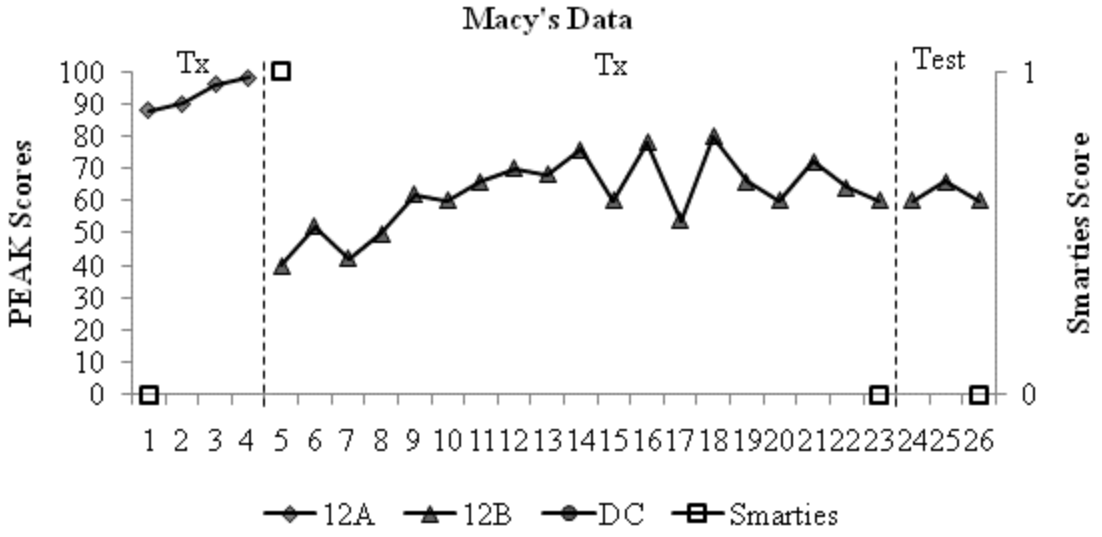

Figure 2. Graph representing Macy's performance across tasks and activities.

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APPENDICES

Appendix A:

Script for Theory of Mind Assessment

Subject is shown a crayon box and asked “What do you think is inside this box?”

The subject will likely respond “Crayons.”

Then the box is opened to reveal coins inside, and the question is asked “What is *really* inside the box?”

The expected response would be “Coins”, “change”, “money”, or similar.

The box is closed and the question is asked to the subject “If we show this box to your teacher, what do you think they will say *they* think is in the box?”

If the subject responds “Crayons”, then they have demonstrated they already have the skill of interest in their repertoire.

However, if they respond “Coins” or similar, then they have not taken the perspective of the teacher who was not present when the box was opened and its’ true contents revealed. *This demonstrates they are a good candidate for the study.

Appendix B:

Program Assessment Form

PEAK PROGRAM ASSESSMENT: EQUIVALENCE PROGRAMS

Choose one for each: Y = Yes N = No ? = Unknown

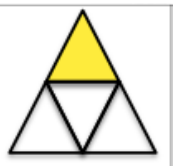
#	Name	Description	Y	N	?
7A	Comparison: C.E. Reinforcing Function	When taught that a stimulus card can be traded for a preferred outcome and that the stimulus card is greater or less than another stimulus, the learner will choose the stimulus card that has the greatest value when given a choice.			
7B	Comparison: C.E. Reinforcing Function	When taught that a stimulus card can be traded for a preferred outcome and that the stimulus card is greater or less than another stimulus, the learner will choose the stimulus card that has the greatest value when given a choice.			
7C	Comparison: ME More Than Less Than	When taught that a stimulus is greater than or less than another stimulus, the learner will be able to identify whether second value is greater than or less than the first.			
7D	Comparison: More Than Less Than Gen.	The learner will select which of two novel comparisons have features that are either greater or lesser in dimension or number than the other given the cues MORE THAN or LESS THEN.			
7E	Comparison: The Cue of "More Than"	When given the cue MORE THAN and an array of two stimuli that differ in dimension or the number of features, the learner will select the greater of the two stimuli.			
7F	Comparison: The Cue of "Less Than"	When given the cue LESS THAN and an array of two stimuli that differ in dimension or the number of features, the learner will select the lesser of the two stimuli.			
10A	Multiple: Time in Relation to Distance	When provided with two statements regarding the relative distance of three locations, the learner will identify which place will take longer to get to			
12A	Perspective Taking: You and I	When shown that a piece of paper has two different images on each side, the learner will be able to state who sees which item using "YOU" and "I".			
12B	Perspective Taking: You and I Reversal	When shown that paper that has different images on each side, the learner will be able to state who sees what when told to reverse perspectives.			
13D	Logic: Disjunctive Reasoning	When taught that two possible solutions to a question and told that one solution is not correct, the learner will be able to provide the other solution.			

Appendix C

Program 12A

Program Instruction Sheet

Program Name: Perspective Taking: You and I – 12A



Goal:
When shown that a piece of paper has two different images on each side, the learner will be able to state who sees which item using "YOU" and "I".

Materials Needed:

- A = A known picture on one side of a paper
- B = A different picture than (A) on a different side of the same paper

Instructions for Caregivers:

1. Train A – B: Show both sides of the paper. Hold the paper up with side (A) facing the learner. Ask, "Who sees (A)?" where the reply "I see (A)" is correct. Next, ask, "Who sees (B)?" where "You see (B)" is correct.
2. Test B – A: Hold up the paper with side (B) facing the learner. Ask, "Who sees (A)?" where "I see (B)" is correct. Next, ask "Who sees (B)?" where "You see (B)" is correct.

Typical Stimuli:

- A = Dog, house, plane
- B = Humming bird, cat, motorcycle

Class	Stimuli A	Stimuli B	Stimuli C	Stimuli D	Stimuli E	Stimuli F
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

	Date Introduced	Date Mastered
Level 1		
Level 2		

0 = no response after multiple attempts at prompts
2 = multiple prompts or reduced stimulus array eventually produced a response
4 = 2 prompts at most produced the response with full stimulus array
8 = 1 single prompt of either verbal or visual nature
10 = independent accuracy on response with no prompt

Appendix D

Program 12 B

Program Instruction Sheet
Program Name: Perspective Taking: You and I Reversal– 12B

Goal:
When shown that paper that has different images on each side, the learner will be able to state who sees what when told to reverse perspectives.

Materials Needed:

- A, B = Paper with an image (A) on one side and another image (B) on the other side
- C, D = Paper with an image (C) on one side and another image (D) on the other side

Instructions for Caregivers:

1. Train A – B: Show both the paper, (A) and (B). Hold the paper with (A) facing the learner. Say, "If I were you and you were me, what do you see?" where (B) is correct.
2. Train B – A: Repeat step 1, but ask, "If I were you and you were me, what do I see?" where (A) is correct
3. Test C – D: Hold up the paper with side (C) facing the learner. Ask, "If I were you and you were me, what do I see?" were (C) is correct.
4. Test D-C: Repeat step 3, but ask, "If I were you and you were me, what do you see?" where (D) is correct.

Typical Stimuli:

- A, D = Dog, house, plane
- B, C = Humming bird, cat, bicycle

Class	Stimuli A	Stimuli B	Stimuli C	Stimuli D	Stimuli E	Stimuli F
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

	Date Introduced	Date Mastered
Level 1		
Level 2		

0 = no response after multiple attempts at prompts
2 = multiple prompts or reduced stimulus array eventually produced a response
4 = 2 prompts at most produced the response with full stimulus array
8 = 1 single prompt of either verbal or visual nature
10 = independent accuracy on response with no prompt

Appendix E:

PEAK Data Sheet

Transformation Data Sheet

Date:__________ Instructor Initials:______

Phase: _________ Train Test

Trial	Sample	Score				
1		0	2	4	8	10
2		0	2	4	8	10
3		0	2	4	8	10
4		0	2	4	8	10
5		0	2	4	8	10
6		0	2	4	8	10
7		0	2	4	8	10
8		0	2	4	8	10
9		0	2	4	8	10
10		0	2	4	8	10
			Total:			

Phase: _________ Train Test

Trial	Sample	Score				
1		0	2	4	8	10
2		0	2	4	8	10
3		0	2	4	8	10
4		0	2	4	8	10
5		0	2	4	8	10
6		0	2	4	8	10
7		0	2	4	8	10
8		0	2	4	8	10
9		0	2	4	8	10
10		0	2	4	8	10
			Total:			

Phase: _________ Train Test

Trial	Sample	Score				
1		0	2	4	8	10
2		0	2	4	8	10
3		0	2	4	8	10
4		0	2	4	8	10
5		0	2	4	8	10
6		0	2	4	8	10
7		0	2	4	8	10
8		0	2	4	8	10
9		0	2	4	8	10
10		0	2	4	8	10
			Total:			

Phase: _________ Train Test

Trial	Sample	Score				
1		0	2	4	8	10
2		0	2	4	8	10
3		0	2	4	8	10
4		0	2	4	8	10
5		0	2	4	8	10
6		0	2	4	8	10
7		0	2	4	8	10
8		0	2	4	8	10
9		0	2	4	8	10
10		0	2	4	8	10
			Total:			

Phase: _________ Train Test

Trial	Sample	Score				
1		0	2	4	8	10
2		0	2	4	8	10
3		0	2	4	8	10
4		0	2	4	8	10
5		0	2	4	8	10
6		0	2	4	8	10
7		0	2	4	8	10
8		0	2	4	8	10
9		0	2	4	8	10
10		0	2	4	8	10
			Total:			

Phase: _________ Train Test

Trial	Sample	Score				
1		0	2	4	8	10
2		0	2	4	8	10
3		0	2	4	8	10
4		0	2	4	8	10
5		0	2	4	8	10
6		0	2	4	8	10
7		0	2	4	8	10
8		0	2	4	8	10
9		0	2	4	8	10
10		0	2	4	8	10
			Total:			

Phase: _________ Train Test

Trial	Sample	Score				
1		0	2	4	8	10
2		0	2	4	8	10
3		0	2	4	8	10
4		0	2	4	8	10
5		0	2	4	8	10
6		0	2	4	8	10
7		0	2	4	8	10
8		0	2	4	8	10
9		0	2	4	8	10
10		0	2	4	8	10
			Total:			

Phase: _________ Train Test

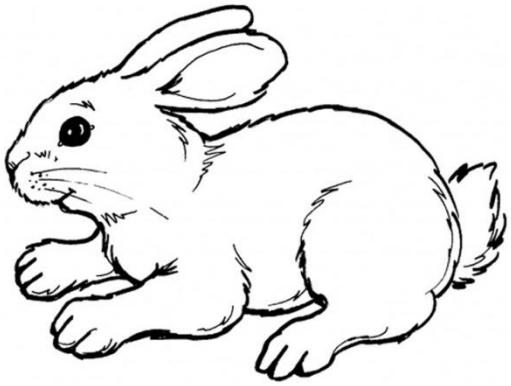
Trial	Sample	Score				
1		0	2	4	8	10
2		0	2	4	8	10
3		0	2	4	8	10
4		0	2	4	8	10
5		0	2	4	8	10
6		0	2	4	8	10
7		0	2	4	8	10
8		0	2	4	8	10
9		0	2	4	8	10
10		0	2	4	8	10
			Total:			

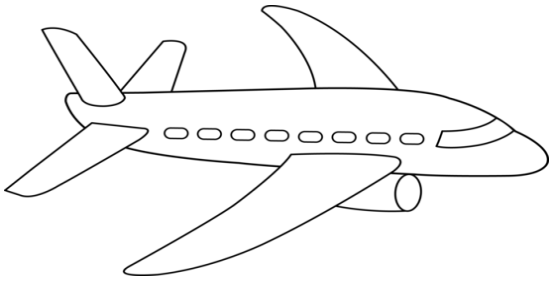
Phase: _________ Train Test

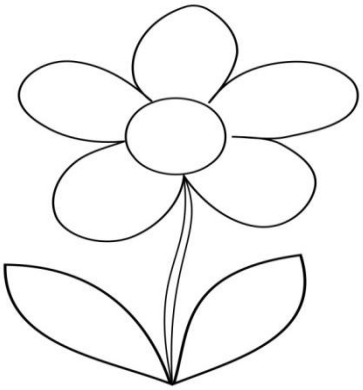
Trial	Sample	Score				
1		0	2	4	8	10
2		0	2	4	8	10
3		0	2	4	8	10
4		0	2	4	8	10
5		0	2	4	8	10
6		0	2	4	8	10
7		0	2	4	8	10
8		0	2	4	8	10
9		0	2	4	8	10
10		0	2	4	8	10
			Total:			

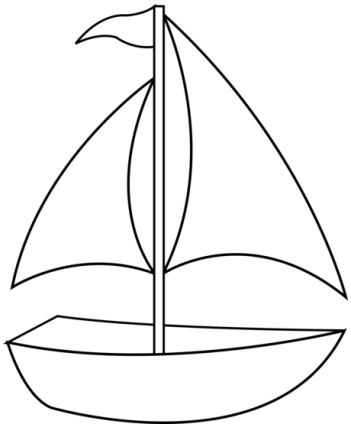
Appendix F:

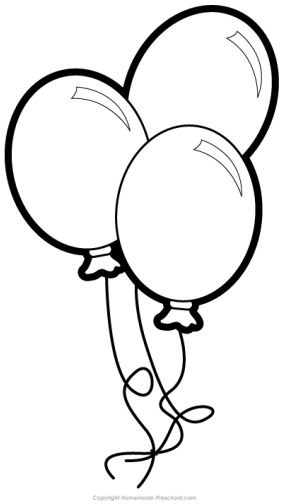
“A” Stimuli Pictures “B”





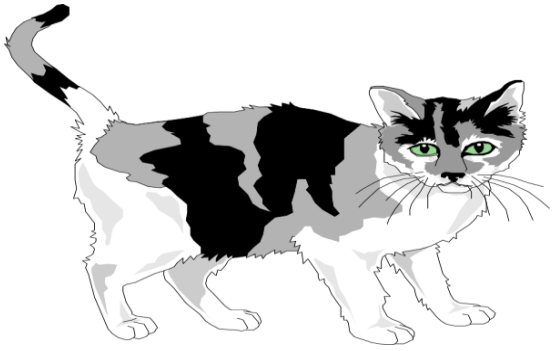


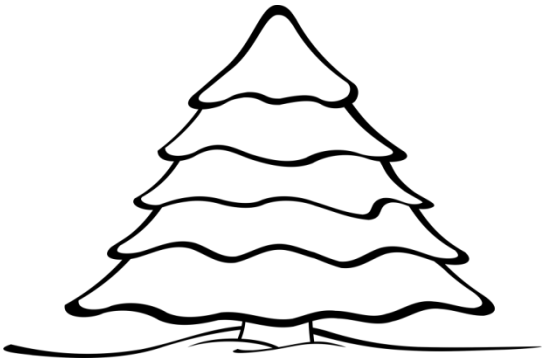




Appendix G:

“C” Stimuli Pictures “D”





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TRAINING DEICTIC RELATIONS TO CHILDREN WITH DEVELOPMENTAL DELAYS THROUGH THE USE OF THE PEAK RELATIONAL TRAINING SYSTEM

Major Professor: Dr. Mark Dixon