COMPARING THE EFFECTIVENESS OF SOCIAL SKILLS DEVELOPMENT
INTERVENTIONS WITH THERAPEUTIC HORSEBACK RIDING IN CHILDREN WITH
AUTISM: AN ALTERNATING TREATMENT DESIGN

by

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Abstract

This study aims to examine and compare the effects of applied behavior analysis treatments in conjunction with therapeutic horseback riding (THR) and the improvement of social skills in children with autism spectrum disorder (ASD). The research study compared the effectiveness of social behavior approaches during three conditions (THR, THR with token reinforcement, and THR with visual cues) using a single-subject research design to determine the "best treatment" for improving social skills among children with ASD (N=4). During the comparison phase, the researcher determined the frequency rate of receptive social skills and frequency of expressive social skills among each condition to determine the most effective approach in facilitating observed social skills. Results of this study indicated that while all three conditions increased social skills (receptive and expressive), the use of token reinforcement was the most effective in increasing the number of receptive and expressive communications. Practical implications and future research needs are provided for addressing social skill development with children with ASD.

KEY TERMS: Therapeutic Horseback Riding, Social Communication, Autism Spectrum Disorder, Behavior Analysis, Single Subject Design

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By

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Introduction

In a quote by Brown, a horsewoman, "A horse is the projection of peoples' dreams about themselves – strong, powerful, beautiful – and it has the capability of giving us an escape from our mundane existence" (n.d., para. 1). Horses have assisted humans for thousands of years through work, transportation, sport, and leisure while creating a sense of relaxation and increasing strength through interaction (Gustafson, n.d.). The use of therapeutic horseback riding (THR) is a form of animal-assisted therapy that uses the horse as a treatment intervention to serve multiple health areas such as mental and physical health when developing programs. Several aspects of THR work together to meet the outcomes of participants, including the presence of a large herding animal (e.g., the horse), the inclusion of techniques that mirror behaviors and being a non-judgmental/unbiased form of treatment (Koca, 2016). Researchers have reported that animal-assisted therapy, specifically those with horses and dogs, increases positive social behaviors such as smiling, facilitates positive physical contact, and decreases negative behaviors or behavioral problems in children with developmental disabilities (Anderson & Meints, 2016). This study will further explore the use of THR to increase the social skills of children with developmental disability.

<center>**Literature Review**</center>

Autism and Social Skills

      Autism Spectrum Disorder (ASD) is one such developmental disability affecting the

verbal and nonverbal communication and social interaction, as well as affects a child's

performance (American Psychiatric Association, 2013). Other characteristics often associated

with ASD are engagement in repetitive activities and stereotyped movements, resistance to

environmental change or change in the daily routines, and unusual responses to sensory

experiences (Smith, 2006). The many associated disorders of ASD typically manifest early in

development, often before the child enters school, and are characterized by deficits or differences

in brain processes that produce impairments of personal, social, academic, or occupational

functioning (Thapar et al., 2017). ASD involves impairments in areas of nonverbal behaviors

such as eye contact, facial expressions, body postures and gestures that regulate social

interactions that negatively impact children with ASD fail to develop peer relationships and lack

social or emotional reciprocity (American Psychiatric Association, 2013). As a result of this,

individuals with ASD often have difficulty forming relationships and communicating with others

with and without disabilities (Brady et al., 2016). Children with ASD can display a decreased

preference and orientation to social stimuli, lack of interest in social activities, deficits in

reciprocal social interactions, and difficulties in social situations (Supekar et al., 2018).

Therefore, there seems be a critical need to increase social skills to enhance a child's ability to

form social attachments (Sadiq et al., 2012). Approximately 26% of adults with developmental

disabilities, including those with ASD, lead an isolated and less productive life, with a lack of

friends and little engagement in occupational, vocational, or recreational social activities

(Cederlund et al., 2007). Since there is no apparent cure for ASD, the use of behavioral

interventions to develop social skills should be further considered by professionals working with children with ASD (Nelson et al., 2011).

Behavior Management Interventions

Applied behavioral analysis (ABA) is a type of behavior management approach that uses techniques that use reinforcement and conditioning to positively affect prosocial behaviors (Ithriyah, 2018). From the principles of Skinner's operant conditioning, ABA works to shape behaviors through interaction of antecedents (i.e., what precedes a specific behavior), the response to that behavior, and the resulting consequence (Murphy & Barnes-Holmes, 2009). The use of token reinforcement (e.g., positive reinforcement) creates a way to reinforce positive behaviors by using compliments, tokens, positive feedback, or advancement (Ithriyah, 2018). Positive reinforcement can strengthen the behavior and promote a change in the direction that will help client or participant reach target goals (Miltentenberger, 2016). Charlop-Christy (1998) suggested token reinforcement reduced inappropriate behaviors in three children with ASD (age ranges 7-9) when they used a multiple baseline to determine the percentage of correct task responses and occurrence of inappropriate behavior. When token reinforcement was used there was a 10-20% increase in percentage ranges of social behaviors. The use of visual cues such as images, written words, or a combination of both in a specific or non-specific order have also been used to teach social skills to individuals with ASD (Autism Speaks, 2020). Implementing visual cues in programs has demonstrated decreases in anxious behaviors in situations where coping, attentions, confusion with directions has been present (Robinson et al., 2013) Ganz (2008) determined that visual cues in social stories and scripts increased (range 0-15) social communication in children with autism (N=3). While behavior management approaches have been a common strategy for promoting social skills in children with ASD, their use has been a

novel approach with other treatment approaches, such as THR, to addresses deficits in social skills.

Therapeutic Horseback Riding

Therapeutic horseback riding (THR) is a broad term that refers to interventions with horses, whether it is with the movement of riding, grooming, tacking, or just interaction to meet sensory, cognitive, or motor skills goals (Koca, 2016). All aspects of THR can be used in teaching multistep directions to individuals with ASD. Several studies reported positive results of THR for participants with ASD. For example, Zhao et al. (2021) found that THR provides a therapeutic environment that can help enhance the social, cognitive, and communication skills for children with ASD. Gabriels et al. (2015) also reported that working with equines (i.e., horses) also helps to improve self-regulation and empathy, improve social cognition and communication, reduce hyperactivity and irritability, and reduce maladaptive behaviors for children and adolescents with ASD. While the use of THR and behavioral management interventions have both been used to enhance the social skills of children with ASD, there is little to no evidence on the effectiveness of behavior management approaches used in conjunction with THR. Therefore, this study examined the effectiveness of THR with behavior management techniques and how they can be used to build social skills in children with ASD.

Methods

Research Questions

This research study examined if therapeutic horseback riding (THR), alone and with comparable behavioral management approaches, improved social communication skills in children with ASD. To assist in determining the effectiveness of these interventions, the research questions for this study were:

1.   Which treatment method (THR, THR with token reinforcement, or THR with visual cues) is best at improving the frequency rate of receptive social skills in children with ASD?

2.   Which treatment method (THR, THR with token reinforcement, or THR with visual cues) is best at improving the frequency of expressive social skills in children with ASD?

Research Design

Single-subject methodology was implemented over an 8-week period to compare specific social skill target behaviors across time and examine THR conditions for effectiveness. Single-subject research designs are particularly appropriate when the researcher wishes to understand the performance of a specific intervention under a given set of conditions (Tawney & Gast, 1984).

Alternating treatment design (ATD). A single subject ATD was used to compare the effectiveness of using therapeutic horseback riding (THR), THR with token reinforcement (THR-TR) and THR with visual cues (THR-VC) to increase social communication. An ATD is used to compare the effectiveness of independent variables when more than one condition is

being compared (Dattilo et al., 2000) whereas three different phases of study are often implemented including a baseline, comparison, and best treatment phases (Kelley & Loy, 2008). However, because a baseline condition is not always required for ATD (Tawney & Gast, 1984), this study opted to include use a baseline phase due to the proposed scheduled and the reduced length of the THR agency program to ensure adequate comparison of conditions.

Comparison phase. In the comparison phase, all three conditions were implemented during a total of seven weekly sessions. Each intervention condition was introduced to the same behavior in a random and rapid alternating manner across time periods (Dattilo et al., 2000). Each participant received a once a week, 30-minute lesson that included a 10-minute segment in *each* condition (e.g., THR, THR-TR, & THR-VC). During each portion of the 10-minute segment, the same game or lesson protocol was used with each intervention to maintain consistency of treatments. There was a 1-minute break between each of the three THR sessions to allow for participant and staff transition time to decompensate from previous condition to stop/start video recordings and ensure a smooth definitive change to the next THR intervention. To control for sequential treatment effects (Barlow & Hayes, 1979), each condition was randomly assigned in 9-minute increments over the duration of the comparative phase. All attempts by researcher and instructor were made to ensure that the session was the same for all participants and the instructor used the same lesson protocol as outlined in the procedural reliability sheet (see Appendix A). All sessions were videorecorded for data recording and behavioral observation. Specific details of THR content are mentioned in "Independent Variables".

Best treatment phase. To determine the "best treatment," ATD data from all three conditions were examined. The "best treatment" was determined by examining which condition

(THR, THR-TR, THR-VC) demonstrated the highest levels of receptive and expressive social skills in the comparison phase. During the best treatment phase, the condition that demonstrated the highest level (i.e., frequency rate for RSS and frequency for ESS) was implemented without the presence of the other two conditions to determine and control for potential multi-treatment interference (Tawney & Gast, 1984). If the "best treatment" displayed similar levels as those within the comparison phase, there is greater evidence of a lack of multi-treatment interference (Dattilo et al., 2000). Similar procedures were conducted for both receptive and expressive communications.

Study Participants

This study consisted of four participants with ASD age range of 5-7 already registered to the partner therapeutic riding program. Each participant had to meet the following criteria to be selected for the study: a) registration as a participant in the partner agency's THR program; b) recommendation for study participation from THR center director; c) participant lacked social communication skills; d) completion of participant assent form (see Appendix B); and e) completion of parent or guardian consent form (see Appendix C). It was particularly important to select school age children as this is the time period when children are first learning developmental skills to build relationships, use appropriate interactions, and follow directions under guidelines from individuals that are not always their parents or guardians (Timler et al., 2014). Participants were chosen by the partner agency based on the requests and criteria given by researcher. Participants were assigned a hypothetical name to protect anonymity. Descriptions of the four participants include:

Amy. Participant was a 6-year-old female White with two years THR experience at the agency. In addition to her primary diagnoses of ASD and Attention Deficit Hyperactivity

Disorder (ADHD), this participant had multiple diagnoses including hypertonia, asthma, sleep disorders, aphasia, mast cell activation, and mild visual impairment. According to guardians and program staff, Amy had an Individual Education Plan (IEP) with goals including improving focus and concentration at school, social skills, and maladaptive (disruptive) behaviors. The partner agency recommended her for this study to specifically increase receptive communication skills including following multistep directions. Amy has interests in unicorns, horses, fairies, princesses, and enjoys playing games which may help in identifying her specific token reinforcement.

Beth. Participant was a 6-year-old female Hispanic with six months THR experience. The participant was diagnosed with ASD and had two younger siblings with ASD symptoms. She was homeschooled but attended a speech therapy program to increase social communication skills. Of note was the fact that She had a different language approach as she preferred to communicate through a stuffed animal that she always carried with her. Her family/parent identified decreasing the need for this behavior as a primary goal. The partner agency believed Amy's participation in this study, particularly with the additional THR conditions (THR-TR, THR-VC), would help her build expressive communication skills without the use of her alternative form of communication. It was also determined that Beth's interest in art and animals provided a preferred source for her token reinforcement.

Chris. Participant is a 7 y.o. male African American with minimal THR non-riding lessons and riding experience prior to this study. The participant was diagnosed with ASD with mixed receptive/expressive language disorder and had an IEP that included goals related to building social skills and reducing social anxiety. It was reported that he had sensory processing issues and was very distractable. Due to his high distractibility, THR program leaders

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recommended more isolated lesson locations to work on his goals of increasing skills in following directions (i.e., receptive) and asking questions at socially appropriate times. Chris enjoyed video games, creating video game storylines, and being with peers.

David. Participant was a 7-year-old male White with no riding experience prior to study. The participant had a diagnosis of ASD and tended to get emotional when he didn't make his own decisions. David was monitored when having emotional episodes as he had a history of evading and escaping others. David's parents expressed a desire to address creating positive transitions between activities, following directions, speaking in more complex social interactions, and coping skills. Since age three, David's IEP has included improving social skills. The THR partner agency recommended David for this study to continue to build communication skills and reduce scripted behaviors. David also enjoys video gaming and interacting with animals.

Dependent Variables

Dependent variables are measured and observed repeatedly across and within controlled conditions of the THR intervention to identify and compare the behavioral patterns throughout all phases of the study (Horner et al., 2005). This dependent variable and central focus of this study was to improve social communication skills in children with ASD. *Social communication* refers to the emergence of verbal and nonverbal skills, social interaction, ability to cooperate with others, sharing equipment, making conversation, using eye contact, and social cognition targeted at those in a person's social circle including family members, peers, providers, and educators (NIDCD, 2020). Social communication can be interpreted as how one expresses (e.g., expressive social communication) and receives (e.g., receptive communication) his or her communication characteristics and interpersonal responses that allow a child to adapt to the

environment through verbal and nonverbal communication (NIDCD, 2020). This study examined social communication as both receptive and expressive social skills and as defined in the *Therapeutic Recreation Activity Assessment* (Hoss, 1993).

     Receptive social skills (RSS). Research question one is concerned with determining the best condition to promote receptive social skills. Receptive social skills (RSS) in this study were the primary target behavior in this study and defined as verbal exchanges from the participant in response to the social antecedent (e.g., "What is your name?) provided by the THR leader (Cummings, 2021). Furthermore, RSS are social exchanges that indicate one's cognitive comprehension upon receiving a social antecedent from another person (Aggarwal, 2022). Specific target behavior descriptions of RSS include:

     a) content of speech appropriate to the social situation (e.g., saying please, thank you, you're welcome, showing appreciation), b) speech volume that is appropriate to the social situation (e.g., is the participant yelling), c) appropriate facial affect (e.g., smiling, eye brows raised or scrunched when provided a social antecedent), d) appropriate motor movements, (e.g., is the participant keeping their hands still or are they stimming/flapping), e) following directions without prompts, and f) responding verbally to another's social communication.

Because RSS depends on the leader to initiate a social antecedent or social opportunity for its' existence, an RSS will also be recorded as a frequency *rate* to control for number of available opportunities provided by the THR leader within each condition.

     Expressive social skills (ESS). Another type of social skill is expressive social skills. Expressive social skills (ESS) are defined as those social skills that provide an opportunity for the participant to appropriately communicate and express themselves (Hoss, 1993) and often

including the ability to request objects, make choices, ask questions, and describe events (Smith, 2006). Specific target behavior definition of ESS include:

> a) Initiating speaking to another person to express himself/herself, b) gesturing (waving, pointing), c) facial expressions (crying, smiling), and d) vocalizations (crying, yelling).
>
> ESS verbal or nonverbal behavior is unprompted by the instructor.

ESS behaviors will be recorded as a frequency count within each condition.

Independent Variables

The independent variables (i.e., treatment conditions) for this research study include 1:1 (participant: instructor), 30-minute lessons that included segments of: (a) therapeutic horseback riding (THR) alone, (b) THR with token reinforcement (THR-TR), and (c) THR with visual cues (THR-VC). All participants had the same type of lessons including games and riding patterns consistent with the procedural reliability guide (see Appendix A). Appendix D and E provide example lesson plans and multi-step therapeutic games for implementing during the lesson. The lesson activity was chosen based on its appropriateness and included tasks that highlighted the reinforced the objective and skill taught. Other THR activities that supported social skill development included structured mounted games with same-age peers that promoted cooperation, turn-taking, and following directions (e.g., red light-green light, Simon says, catch and throw). Before each week's lesson, instructors at the agency planned the lesson objective, then decided on a complementary activity to allow riders additional or varied opportunities to practice the skill(s) needed to meet the identified objectives including social communication. Instructors were trained during procedural fidelity training and pilot testing before the start of the study to follow the procedural reliability checklist for each intervention. The same lesson

procedures were used during all THR lessons so that the only difference was the inclusion of the intervention condition (THR, THR-TR, THR-VC).

Therapeutic horseback riding (THR). In reality, THR alone is the control condition without the presence of the two behavior management approaches. The PATH-certified instructor focused the lesson on horseback riding skills and participant goals during the THR session. During this lesson portion, there was no intended or planned token reinforcement or visual cueing for desired target behavior goals (see Appendix F) however, there may have been some minimal and unintentional verbal reinforcements (e.g., praise, high five) used during the THR condition with TR or VC.

THR with token reinforcement (THR-TR). The THR-TR condition included THR sessions in conjunction with the use of token reinforcement strategies that used contingency management based on the systematic reinforcement of a target behavior (Fiske et al., 2015). The "reinforcers" in this study were tokens (i.e., "pirate coins") that could be exchanged for prizes based on each participant's interest (e.g., one participant exchanged token reinforcers for Disney princess-themed prizes because of her interest). When working with individuals with ASD, Helm (n.d.) suggested it was most beneficial to use *continuous* reinforcement directly after a participant engaged in the desired target behavior to positively reinforce the behavior and increase the likelihood of it being repeated. However, to limit distractions in the THR-TR lessons, instructors put a token (pirate coin) in a pouch on the participant's waist when the target behavior (receptive or expressive social skill) was demonstrated, and these reinforcers were later exchanged for actual prizes.

THR with visual cues (THR-VC). THR-VC condition includes THR in conjunction with visual cues provided to the participant. Because children with ASD may not always grasp social

expectations (e.g., like how to start a conversation, how to respond when others make social approaches, how to change behavior based on unspoken social rules), visual cue prompts, or "supports", can often help teach social skills and help children with ASD to use social communications independently (ASERT, n.d.). In this study, the instructor used visual cues of the social behaviors and directions to be followed during the THR-VC sessions in the form of cards that depicted the desired target behaviors (see Appendix G visual cue card examples). The instructor presented the participant with brief verbal instructions and then a board with visuals representing the desired target behaviors. For example, one card displayed a horse walking and a person talking to represent that if we want the horse to go, the participant must say "walk on." Detailed procedures of the THR-VC process are in Appendix A.

Data Analysis

To interpret results of this study, the researcher reviewed the video recordings of each lesson to individually count the frequency of the participant's social skill behaviors. Videos were watched from two recorded camera views (i.e., instructor view and participant view). Determination of the "best treatment" occurred by calculating which intervention condition (THR, THR-VC, THR-TR) was associated with the highest level of expressive and receptive social communications (Tawney & Gast, 1984) in the comparison phase. Research assigned split points when frequencies were equal between conditions. For example, if frequencies were equal among two conditions, a score of 0.5 was assigned to each. Consequently, equal frequencies among three conditions resulted in the assignment of 0.33 points to each condition. Finally, the strength of treatment conditions was also evaluated by the amount of overlap and mean differences between conditions. Strong THR treatment conditions demonstrate low overlap with other conditions and higher means than other conditions (Tawney & Gast, 1984).

During the "Best Treatment" phase, the intervention that produced the highest levels of target behaviors within the comparison phase was implemented again during week eight. Performing the session without the presence of the other two conditions allowed for the potential to provide greater confidence in the absence of multi-treatment interference (Neuman & McCormick, 1995). Multiple treatment interference refers to an interaction due to the presence of more than one treatment that potentially influences data performance (McGonigle et al., 1987).

Target outcome measurement. As mentioned earlier in "Dependent Variables", RSS is influenced by the number of social opportunities presented to participants. Therefore, to control the influence of the actual number of social antecedents provided by the THR leader, the frequency *rate* of RSS was used rather than merely total RSS frequency. RSS frequency rate was defined as the number of times the participant responded socially when presented with a social antecedent by the THR leader. This was calculated by the following formula: the # of RSS demonstrated by the participant divided by the # of intervals within each session in which a social antecedent was provided by THR session leader = RSS frequency rate [expressed as a percentage (%) from 0-100]. While procedural reliability protocols were used to help with consistency, the practical reality is that not all sessions were identical based on the interaction of the participant in each session. Therefore, the use of behavioral *rate* of RSS rather than frequency helped control any slight differences in the number of social antecedents provided by the THR leader. Conversely, expressive social skills (ESS) can be demonstrated *without* social antecedents from the THR leader and were therefore calculated by the frequency of 15-second intervals that included the ESS as defined by the target behavior definition used in this study.

Interval recording system. Each session was viewed in 15-second intervals as indicated by the time counter on the screen. For the RSS, the researcher first viewed each session to

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determine the presence of the social antecedent provided by the THR leader. This time segment was noted by the researcher and only those 15-second intervals including social antecedents from the THR leader were considered for review. Next, the researcher reviewed the recorded time intervals that included a social antecedent and determine if the participant provided an RSS as defined by the target behavior definition in response to the social antecedent. The data collection sheet (Appendix H) was set up to count the 9-minutes of the condition time and 1-minute transition time. The frequency rate for RSS and frequency count for ESS were only counted during the 9-minutes of the condition. There were no behaviors counted during the 1-minute transition. This time was spent walking around, although there may have been interactions during this time it was not part of the session. If the RSS occurred within the interval, the researcher indicated the presence of the target behavior by placing an "X" on the data collection sheet (see Appendix H) for the corresponding 15-second interval (Loy & Dattilo, 2000). For the ESS, the researcher (i.e., primary observer) conducted how many of the 15-second intervals included an ESS frequency or RSS frequency rate for each condition session and each participant (Loy & Dattilo, 2000).

Graphing data. Line graphs for both the RSS and ESS behaviors were created for each participant. The RSS frequency rate of each behavior was graphed via Y (i.e., vertical) and X (i.e., horizontal) coordinates so as all three conditions (THR, THR-TR, THR-VC) data points were stacked in a column format for the corresponding session in order to evaluate which condition produced the highest frequency rate of RSS and ESS behaviors (Dattilo et al., 2000). The horizontal "X" line of the graph indicated the session number, and the vertical "Y" line of the graph indicated the percentage of sessions (i.e., RSS) or frequency count (i.e., ESS). This procedure occurred for all seven sessions and was graphed individually for the number of social

skills for each individual participant across sessions. Each condition was represented on the graph by a different symbol and color to better differentiate conditions and outcome levels. Each participant's graph includes a "Comparison Phase" and a "Best Treatment Phase".

Interrater reliability. Inter-rater reliability is a measure of consistency used to evaluate the extent to which different observers agree in their assessment decisions and is essential when making decisions in observational research and clinical settings (APA, 2010). In this study, inter-rater reliability was calculated to measure the agreement between the lead researcher and a secondary observer (i.e., a peer graduate student) to maintain the reliability of target behavior scoring. Tawny and Gast (1984) suggested that at least 20% of procedures and observations be checked by a trained secondary observer with a minimum of 80% agreement criteria to provide increased evidence of both procedural and inter-observation reliability. Prior to data analysis, the secondary observer was trained to observe pre-study practice observations until 80% agreement was reached with lead researcher observations and target behavior definitions. Sessions were chosen at random from each phase before the beginning of the data collection period. Researcher will watch videos more than once to help ensure prompts and skills are captured. Videos were watched on a weekly basis to keep pace with the data collection. Videos were not watched for longer than four hours at a time to ensure there was not fatigue in the researcher from viewing. Secondary researcher also watched in smaller segments.

Results

Receptive and Expressive Social Skills

Table 1 provides comparisons for highest frequency rates, means, and ranges for all three receptive social skill conditions. In addition, overlap between the two phases are also listed to portray the potential presence and control for multi-treatment interference. Individual participant percentage rates are graphed for receptive communication social skills. Further explanation into the scores between conditions is explained within results for each participant. Table 2 provides an overview and comparison of how each intervention performed in promoting expressive social skills (ESS) and includes comparison for highest frequency counts, means, and ranges for all three conditions. In addition, best treatment ranges and overlap between the two phases are also listed to determine the presence for multi-treatment interference. Individual participant percentage rates for receptive and expressive communication social skills are shown in figures 1-4. Further explanation of scores between conditions is explained within results for each participant.

Table 1

Summary of Receptive Communication Social Skills

Participant	Comparison of Interventions			"Best" Range in Best Treatment Phase	Overlap between Comparison/Best Treatment
	THR	THR-TR	THR-VC		
Amy	0/5 *M*=80.2 range=75-83	**5/5*** *M*=93.6 range=89-96	0/5 *M*=84.6 range=78-91	93-94	100%
Beth	0/5 *M* =83.4 range=78-88	**3/5*** *M* =89.8 range=88-92	2/5 *M* = 87.4 range=80-92	90-92	100%
Chris	.5/6 *M*=87.8 range=82-100	**3.5/6*** *M*=91.3 range=83-100	2/6 *M*=87.7 range=81-91	90-91	100%
David	.83/6 *M* =94 range=90-100	**3.83/6*** *M* =97.5 range=95-100	.33/6 *M* =96.7 range=94-100	98-100	100%

* = "Best" Intervention with Highest Frequency Rate of Receptive Communication Social Skills

Table 2

Comparison of Participant Expressive Social Skills Frequency

Participant	Comparison of Interventions			"Best" Range in Best Treatment Phase	Overlap between Comparison/Best Treatment
	THR	THR-TR	THR-VC		
Amy	0/5 *M*=9.3 range=7-12	**5/5*** *M*=18.4 range=11-22	0/5 *M*=12.8 range=7-17	22-24	33.33%
Beth	2.5/5 *M* =1.0 range=0-2	**2.5/5*** *M* =1.2 range=0-2	0/5 *M* =.4 range=0-1	1-2	100%
Chris	1/6 *M*=22.17 range=12-35	**3/6*** *M*=25.83 range=18-37	2/6 *M*=24.83 range=18-36	24-32	100%
David	.33/6 *M* =35.0 range=33-37	**4.33/6*** *M* =38.17 range=37-44	1.33/6 *M* =36.50 range=34-37	35-38	66.67%

*= "Best" Intervention with Highest Frequency of Expressive Social Skill

Amy. Amy attended all THR sessions (7/7) in the comparison phase. However, data from only 5 sessions are included due to a videotaping technical issue in sessions two and three (see figure 1). Table 1 and figure 1 present the comparison of receptive social skills with Amy. Of the four participants, Amy was in the lower frequency percentage rate range of receptive social skills

(75-83%). The THR-TR had the highest frequency rate and mean when comparing the three conditions in all five sessions (see figure 1). The absence of overlap in THR-TR RSS score ranges with the other two conditions strengthens the position that THR-TR was the best approach with Amy. Therefore, data analysis clearly indicated that THR-TR was superior to the other two conditions in promoting RSS. During the Best Treatment phase, the three THR-TR sessions (range= 93-94%) performed within the comparison phase range (89-96%) for 100% overlap indicating a lack of multi-treatment interference (Neuman & McCormick, 1995). When examining the overlap between THR and TR there was no overlap confirming that TR is superior to THR only. The mean frequency rate scores for THR-TR were 93.6% (93.7% during Best Treatment) while THR-VC (84.6%) and THR (80.2%) were significantly lower.

Figure 1

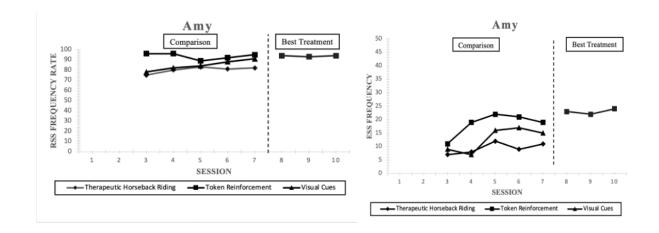*Amy Receptive and Expressive Social Skills*

Table 2 and figure 1 present the comparison of expressive social skills for Amy. Of the four participants, Amy was in the mid-frequency range (7-22) of ESS. THR-TR had the highest mean frequency (18.4) and was also highest in all five sessions in ESS (see table 2, figure 1). Low overlap (20%, 1/5) in the comparison phase with the other conditions provided further

evidence in the strength of THR-TR. During the Best Treatment phase, THR-TR sessions (range= 22-24) performed within the comparison phase range (11-22) for 33.3% (1/3) overlap suggest some potential multi-treatment interference (Neuman & McCormick, 1995). However, a closer analysis of the Best Treatment phase suggested that the presence of the two conditions may have even inhibited THR-TR performance as the mean was 4.6 frequencies higher than during the comparison phase for Amy.

Beth. Beth only attended five of seven sessions in the comparison phase due to illness during weeks 2 and 3. Table 1 and figure 2 present the comparison of receptive social skills with Beth. Of the four participants, Beth was in the lower frequency percentage rate range of receptive communication (78-88 %). The THR-TR had the highest frequency rates among the three conditions in three of the five sessions (see figure 2) with Beth. Visual cues scored highest in two of the other five sessions with small variance to TR range (80-92% and 88-92%). While analysis of data indicated that THR-TR was the best treatment for RSS than the other two conditions, the VC (66.67%) and THR (0%) overlap of comparison phase frequency rate ranges with the THR-TR indicated the superiority of THR-TR was minimal. During the Best Treatment phase, THR-TR sessions (range= 90-92%) demonstrated similar performance (100% overlap) than the comparison phase indicating no multi-treatment interference (see table 1, figure 2). While THR-TR was still the best treatment approach for Beth, THR-VC was still effective in promoting RSS.

Figure 2

Beth Receptive and Expressive Social Skills
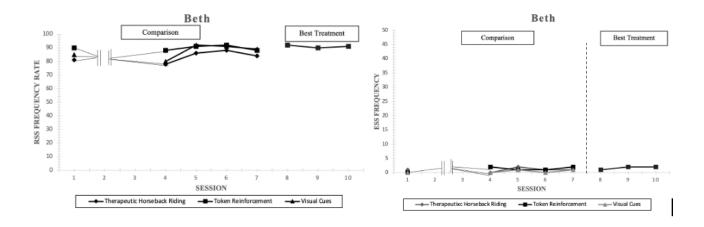
Table 2 and figure 2 present the comparison of expressive social skills with Beth. Of the four participants, Beth was in the lowest frequency range of ESS (0-2). These results were expected as Beth has minimal language skills when unprompted. As shown in table 2, session comparisons indicated that THR-TR an THR had equal ESS as both conditions were best in two out of five sessions. The researcher determined that THR-TR was best due to the *slightly* higher mean frequency than THR (mean difference=.2 frequencies). Videos and the researcher's research journal indicated the main topics of Beth's expressive language was primarily asking the location of her parent and communication with her stuffed animal. With limited ESS frequencies (range=1-2), THR-TR expectedly had 100% overlap with THR when comparing Best Treatment and Comparison phase frequencies. As demonstrated with RSS, Beth required continual skills and development in ESS (i.e., starting conversations and interaction with others). Beth's lack of social interaction frequency, and subsequent lack of variability in the range of scores, limited a *true* comparative analysis of each intervention condition.

Chris. Chris only attended six of seven sessions in the comparison phase due to illness during week 6. Table 1 and figure 3 present the comparison of receptive social skills with Chris.

Of the four participants, Chris was in the higher frequency percentage rate range of receptive communication (82-100%). The THR-TR had the highest mean (91.3%) and frequency rate in three of six sessions when comparing the three conditions (see table 1, figure 3). THR-VC had the highest frequency rate in two of the six sessions while THR-TR and THR had equal frequency rates in week five. While the order of sessions were randomly assigned to control for potential sequential effects, one explanation of the inflated THR performance may have been impacted by a carryover effect from the immediate session of THR. The significantly lower frequency rate range (82-88%) without the session five anomaly further supports this contention. Nonetheless, data analysis indicated that THR-TR was higher performing than the other two conditions for Chris. During the Best Treatment phase, the THR-TR range of frequency rate data (90-91%) indicated 100% overlap with comparison phase range (83-100%) indicating no multi-treatment interference. Overall, although THR-TR was the determined to be the best treatment condition, a high 83.3% overlap (5 out of 6 sessions) between the three conditions suggested only a *slight* superiority (Neuman & McCormick, 1995).

Figure 3

Chris Receptive and Expressive Social Skills
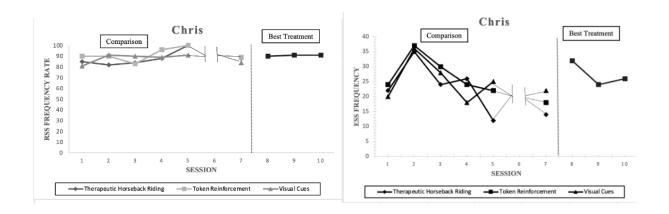
Table 2 and figure 3 present the comparison of expressive social skills with Chris. Of the four participants, Chris was in the medium to high frequency range of ESS (range=14-37). The THR-TR had the highest mean frequency (25.83) and higher frequencies (three of six sessions) when comparing the three conditions in all five sessions (see table 2, figure 3). During the Best Treatment phase, THR-TR (range= 24-32) had 100% overlap with the comparison phase range (range=18-37) indicating no multi-treatment interference. While THR-TR was the best treatment, the small variance in mean frequency differences (TR= 25.83, VC=24.83, THR=22.17) and the high overlap in the comparison phase suggest the superiority was minimal with Chris (Neuman & McCormick, 1995).

David. The participant attended six of seven comparison phase sessions due to illness during week 6. Table 1 and figure 4 present the comparison of receptive social skills with David. Of the four participants, David was in the higher frequency percentage rate range of receptive communication (90-100 %). The THR-TR had the highest mean frequency rate 97.5 and was highest in four of six sessions when compared to the other two conditions. THR-VC scored highest in two of six sessions. In an unexpected occurrence, RSS was equal in all three conditions during week 5 (see table 1, figure 4). Therefore, THR-TR was determined to be the best treatment to the other two conditions for David. During the Best Treatment phase, THR-TR sessions (range= 98-100%) performed within the comparison phase range (95-100%) for 100% overlap suggesting a lack of multi-treatment interference. In summary, THR-TR was determined to be the best treatment in promoting RSS but the high overlap (100%, 7/7) range of scores with the other two conditions suggest minimal superiority (Neuman & McCormick, 1995).

Figure 4

David Receptive and Expressive Social Skills
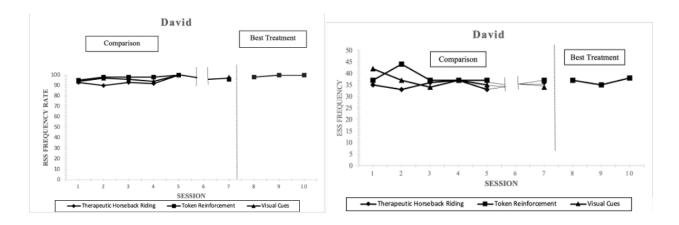
Table 2 and figure 4 present the comparison of expressive social skills with David. Of the four participants, David was in the high frequency range of ESS (34-44). The THR-TR had the highest mean frequency (38.17) and scored highest in four of the six sessions (4/6) sessions when comparing the three conditions in all five sessions (see table 2, figure 4). THR-TR Best Treatment frequency range (range= 35-38) had 66.67% (2/3) overlap sessions with comparison phase range (37-44) indicate that there may have been some multi-treatment interference (see table 2). In summary, THR-TR was the best treatment in promoting ESS for David but the limited variance between (TR= 38.17, VC= 36.5, THR= 35) and the high overlap (83.33%, 5/6) among all conditions in the comparison phase suggest the difference among three conditions is slight (Neuman & McCormick, 1995).

Summary of Results

After the RSS analysis, the strength of token reinforcement (TR) is strong to develop or increase social skills. Although the comparison phase TR scores were highest, relatively high mean scores among all three conditions (TR =93.05, VC=89.1, THR, 86.35) with small variance (mean difference = 6.7%) suggested that all were effective approaches to promoting RSS

frequency rates. The results for expressive social skills indicated once again that token reinforcement (TR) was a powerful condition. However, the smaller mean frequency difference and higher overlap in the comparison phase among all three conditions suggest that the difference between THR-TR and other two conditions was small. Data was relatively stable for all participants (i.e., within 80% of data are within 15% of median data) (Tawney & Gast, 1984) suggesting all three conditions had similar ESS frequency levels. When looking at graphs for all four participants, data primarily displays a neutral slope trend (i.e., not accelerating or decelerating). It should be noted that two of the four participants had some demonstration of multi-treatment interference. Similar to RSS results, all three interventions had similar positive effectiveness, but token reinforcement appeared to be slightly better than the other two approaches.

Interrater Reliability

Interrater reliability represents the behavior scoring agreement between the lead researcher and a trained secondary observer. To assist with the potential for error the sessions were viewed by lead researcher more than once. As well as, on a weekly basis to avoid video fatigue. Seventeen of the eventual 69 sessions (or 24.6%) were reviewed by the secondary observer to check inter-rater reliability. To ensure the 20% of all sessions were reviewed (Tawney & Gast, 1984) some sessions selected for reliability checks prior to the study had to be replaced with other randomly selected sessions due to participant absences and videorecording malfunction. Point-by-point agreement reliability check was calculated to evaluate agreement of observations when an occurrence and non-occurrence resulted (Tawney & Gast, 1984). Overall point-by-point interrater agreement across all dependent measures was $M = 93\%$ (range 87-99) and higher than the recommended 80% criterion (Tawney & Gast, 1984).

Procedural Reliability

Tawney and Gast (1984) also recommended that at least 20% of all sessions be randomly selected and reviewed by the researcher and a secondary observer to ensure consistent procedures and protocols were used in each condition per the established procedural checklists (see Appendix A). Procedural reliability (i.e., total number of implementation steps divided by the correct steps performed by the THR instructors) was 91% (sessions, 2, 4, 6) and well above the 80% criteria (Tawney & Gast, 1984).

Social Validity

Social validity reflects the importance of having intervention methods and outcomes that are relevant and useful to the individuals enacting and/or experiencing the intervention (Kazdin, 2005). Social validity draws attention to whether the goals of treatment, the intervention techniques used, and the outcomes achieved are acceptable, relevant, and useful to individuals beyond the researcher (Kazdin, 2005). In this study, a social validity survey (see Appendix I) was created and implemented after data analysis for the riding center staff, parents, and participants to socially validate the meaningfulness of goals, procedures, and outcomes. Survey rating scale from 1-10, with 10 being "Strongly Agree" and 1 being "Strongly Disagree", was administered and collected to gather social validity. Returned surveys (N=6, 54.5% return rate) were positive with agreements that targeted behaviors were important to investigate, interventions were effective in creating social interactions, research and safety procedures were adequately implemented, and intervention implementation seemed effective. Table 3 indicates results of social validity survey.

Table 3

Social Validity of Study Goals, Procedures, and Outcomes

Social Validity Survey Questions	Mean Score (1-10)
1.) The identified behavior was important to increase for the participant.	8.5
2.) Questions regarding research were answered in a prompt and timely manner to my satisfaction.	8.3
3.) Participant was able to benefit from the interventions used.	8.8
4.) Did the participant benefit from the games/interventions used?	9
5.) Were the interventions effective in creating social interactions?	8.8
6.) Rate your anticipated effectiveness of using visual cues for increasing social communication behaviors?	8.8
7.) Rate your anticipated effectiveness of using token reinforcement for increasing social communication behaviors?	9.5
8.) Rate your anticipated effectiveness of using therapeutic horseback riding for increasing social communication behaviors?	9.2
9.) Procedures used to increase skills were appropriate for participants.	9.3
10.) Safety was implemented in all procedures were used.	10

Discussion

The current study examined if the use of behavior management approaches used in conjunction with THR increased the frequency of social skills. Research questions for this study examined which treatment condition performed best at improving the frequency rate of receptive social skills and frequency of expressive social skills in children with ASD. More specifically, this study examined the effectiveness of THR by itself and in conjunction with other behavior management approaches such as token reinforcement and visual cueing. While results indicated that the token reinforcement in conjunction with THR was the best approach, THR-VC and THR by itself were still relatively effective at producing both receptive and expressive social skills in children with ASD. Results of this study provide further points to discuss.

Strength of Token Reinforcement

Although there was increase in all conditions throughout the study, token reinforcement was consistently associated with the highest frequency rate percentage for receptive communication and the frequency count of expressive communication. Token reinforcement scored the highest for all four participants to demonstrate the extreme strength of this approach in building social skills. This approach has been consistently demonstrated to be effective in changing behaviors since B.F. Skinner led the behaviorist movement in the 1970s. Skinner (1963) built on the work of previous psychologists to establish what he called a "token economy system" that used *operant conditioning* to shape behaviors through a rewards system (Staddon & Cerutti, 2003). Results of the strength of token reinforcement were not surprising and did provide

other effective strategies related to the establishment and implementation of the token economy system in this THR study.

Each participant had a mixture of themes included as "rewards" based on stated pre-study interests from parents and THR leaders. The personalization of participant rewards most certainly strengthened the effects of TR. This supports the belief of Fiske et al. (2015) who suggested that identifying and using token rewards that are meaningful to individuals is critical to the strength of TR. Similarly, Russell et al. (2017) examined the effects of TR as leisure-related rewards and found that leisure reinforcers resulted in the highest average rate of responding as the highest break points were more frequently observed in the TR condition. Russell et al. additionally reported that use of the leisure-based activities was a high value reinforcer for the desired positive behavior. This study also used a combination of interest, high-value, and leisure-related reinforcers such as craft kits and sensory related objects. Furthermore, horseback riding is considered a leisure-based activity (Dashper, 2016) and could be used as a reinforcer for positive behavior (i.e., extending the lesson time, allowing for extra time grooming, feeding horse a treat) (McKissock et al., 2022). When examining the use of TR, the participant's perceived value of the reinforcer certainly impacts the performance of the treatments. Fiske et al. (2015) further examined the assessment and value of the reinforcer to determine if the timing of the reinforcer was influential. The primary or immediate reinforcer scored with a higher response from all participants (N=4). The current study incorporated token coins then after the lesson was over participants received reinforcer from "treasure box." In a study by Charlop-Christy and Haymes (1996), data were collected on children with ASD to analyze the correct percentage of task responses and occurrence of inappropriate behaviors during sessions when using TR. Results of this study also indicated that percentage correct on

task performance was higher when objects of obsession (high value) were used as tokens as opposed to when typical tokens (lower value) were used. Participants in the current study had an overall understanding of what happened with TR and even though the participants did not have a certain number they had to meet, observational data indicated more excitement and recognition during the transition time which could be recognized as a more intriguing to participants. Similarly, while this study used coins as a TR similar to Charlop-Christy and Haymes (1996), the coin reinforcer remained a strong influence in behavior because the token (i.e., coin) was provided immediately following the target behavior and because participants strongly associated the coin (i.e., cause-and-effect) with the eventual high value object of obsession (i.e., personal prize from treasure box). The delayed gratification of the eventual participant prize confirmed evidence that the strength of the TR may need to include a personal connection to the participants and ensure participants accept that tokens are directly connected to obtaining the reward. The current study participants had an overall understanding of what happened with TR and even though the participants did not have a certain number they had to meet, observational data from the videos the participants indicated more participant excitement and recognition during transition which could be recognized as more intrigue and interest on behalf of participants.

Certainly, this study determined that TR is indeed an effective treatment for promoting social skills. However, TR has some disadvantage to consider when implementing (Hackenberg, 2009). For example, there is often a balancing act to make sure that the participant is not only motivated by the external motivator (i.e., the reward), but they develop an intrinsic motivation for the changed behavior and do not become overly dependent on the reward for the desired

behavior (Hackenberg, 2009). Use of the TR must be slowly withdrawn over time to prevent an overdependence on the reward rather than the modified behavior (Russell et al., 2017).

Elimination or "Fading" of Negative Social Behaviors

The design of this study promoted and rewarded prosocial behaviors but did not address the negative behaviors present during sessions. For example, David was very "expressive" asking questions or talking off topic based on the portion of the lesson occurring. While the RSS protocol allowed instructors to prompt the correction of this behavior, but it was impossible to determine if the receptive prompts were just directions for the next task of the THR lesson or if it was for a participant behavior redirection. Similar to Loy and Dattilo (2000), it is important to examine approaches to address both positive *and* negative social interactions in children with ASD. Simply rewarding positive social skills does not always eliminate negative behaviors (Law et al., 2012). In this study, negative or "unproductive" social behaviors still occurred in the presence of rewarding those positive social skills. Addressing negative social behaviors can often impact friendship development or even the willingness to interact with others (Loy & Dattilo, 2000). Addressing and correcting negative or distracting behaviors seem equally important.

Token reinforcement, also known as positive reinforcement, is a powerful behavior management tool to reward individuals who demonstrate target or desired behaviors (Skinner, 1963). In this study, *positive reinforcement* was used to encourage specific social skills. Although not addressed in the current study, there are other forms of reinforcement that can also be used to change behavior (Skinner, 1963). More specifically, *negative reinforcement* is used when one removes something aversive or undesirable so to increase the chance someone will repeat a behavior (Skinner, 1963). For example, a THR rider works hard in their lesson on a particular day (desired behavior) and the THR leader tells them that they do not have to carry the

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heavy saddle (aversive action) to the tack room because of their effort. Another form of operant conditioning includes negative punishment as a contingency when an individual demonstrates a negative behavior (Skinner, 1963). For example, the rider purposely makes a loud noise around the horse (negative behavior) and frightens the horse and the THR leader removes a token (negative consequence) from her pouch causing her to have to earn more tokens to receive her personal reward. This form of negative reinforcement has been much criticized with children with ASD as it is believed children may not always generalize the use of negative punishment with the challenging behavior or the removal of privilege may promote the challenging behavior (Fitzgerald et al., 2016). For example, if a child with ASD exhibits challenging behavior because of overstimulation and then is punished with a time-out in a quiet environment, the "punishment" may have further reinforced the negative behavior because it resulted in the child removing herself from the overstimulation. The use of negative punishment remains controversial and most agree it should be used as a last resort. Godley (2014) suggested justification of addressing negative behaviors may be justified when we examine if the negative behaviors are impacting the ability to form relationships and impacting the participant's quality Fitzgerald et al., (2016) suggested the use of *differential reinforcement of other behavior* (DFO) (i.e., reinforcement provided when a negative behavior is avoided or not provided as expected) instead of punishment. For example, a child rider always throws straw when he approaches the horse. One day, the child does not throw straw and the instructor rewards the behavior to increase the possibility the negative behavior will be avoided again in the future. There are many ways to use Skinner's principles of operant conditioning to change behavior and practitioners should continue to evaluate those effective, and ethical, ways to address both positive and negative social skills in children with disabilities.

Behavior Management and THR

EAT has been used as a treatment option for people with disabilities since the third

century (Morgan, 2006). However, because of the gap in training and knowledge of each

disability population, there are implementation inconsistencies and lack of support for

interventions (McKissock et al., 2022). The center used in the study could be considered small

since there are currently only two THR instructors. One instructor used in the study had previous

experience outside of THR in the use of formal behavior management approaches, as well as

working with children with ASD. The second instructor had extensive horse and instructor

background but not the background needed for specializing with children with ASD. According

to executive director of the agency, at least 80% of their clients served have some form of

intellectual and/or developmental disability. Results of this study indicated that behavior

management approaches such as TR and VC strengthened the effectiveness of THR. Therefore,

such evidence provides further support for ensuring THR staff and instructors have knowledge of

these behavior management approaches to further enhance the effectiveness of THR. Due to a

wide range of behaviors seen in children with ASD (e.g., delays in communication, lack of

appropriateness, repetitive behaviors, rocking back, and forth), it is critical for THR service

providers to have knowledge and training in interventions that may decrease negative behaviors

and increase social skills (Boyd et al., 2011). THR instructors are often required to complete

training through PATH (*PATH. Int., n.d.*) but the training is specific to equine-specific

approaches (*PATH. Int., n.d.*). THR instructors often have training and education from multiple

disciplines, it seems appropriate to provide additional education and training, even if general,

concerning the use of token economy systems and social visual cueing in conjunction with THR.

THR alone demonstrated in this study effectiveness in promoting social skills in children with

ASD. However, there appears to be even more potential when used in conjunction with behavior management approaches like TR and VC.

Finally, this study provided a very structured and planned THR/behavior management approach directed at promoting social skills development. Since intellectual and developmental disabilities such as ASD are so complex and have different levels, as well as conditions that may also affect the person, it is imperative that the instructors of studies understand the arrangement and implication procedures. Structure and organization are often a typical arrangement preferred by ASD populations (Koldewyn et al., 2013). Identifying specific protocols when teaching socials skills using techniques of behavior management, such as ABA, seems warranted in THR. The use of a standardized protocol-based THR programs, such as "Galloping Towards Success" (McKissock et al., 2022), would provide greater therapeutic potential and ultimately add more evidence-based research in the field.

Study Limitations

Potential limitations, both research design and client-related, occurred during this study. Alternating treatment designs require an increase amount of consistency within facilitating the interventions emphasizing the importance and criticality of procedural reliability (Neuman, 1995). The truest control would be to examine THR without any form of reinforcement for demonstrating the target behaviors and it should be noted that a form of token reinforcement can be verbal praise. Therefore, it would be impractical, if not unethical, for the instructor to withhold verbal praise during the sessions not affiliated with TR (THR & THR-VC). The creation a physical type of token reinforcement, such as a sticker or bracelet, was chosen to differentiate from any conscious or unconscious verbal praise provided during sessions. But, to a

certain extent, verbal praise and other unintentional reinforcement by the instructor certainly may have had an impact on participant behaviors.

Furthermore, environmental factors such as the weather were out of control of the researcher. In the case of inclement weather, indoor interventions such as grooming and sensory room activities were substituted by the instructor. Two riding sessions were moved indoor due to weather. While THR instructors followed same format and protocol in conducting lessons, changes to the lesson could have altered the responses from participants if they were anticipating being able to ride the horse. All participants continued throughout the entire study, however there were missing sessions which could have affected results since the duration of the study was limited in duration. While every attempt was considered, make-up sessions was based on the availability of instructor, facility, horse, volunteers, and participant. Due to the limit in instructor and participant availability, it was decided by agency that missed sessions were not able to be rescheduled.

Other missing data was noted as this study relied almost fully on technology to score the participants making the presence and accuracy of data extremely vulnerable. While videorecording behaviors can be a valuable way to visualize THR effectiveness, technology set-up and implementation is often complex and not everyone is comfortable with its' set-up. Errors within operation of cameras occurred resulting in some missing data, disruption in sound occurred, unknown overuse of memory cards resulted in recording errors, and limited ability to observe all behaviors with distorted views. Having a backup plan or ability to collect data if these occur would be recommended in future studies. For example, using a side walker with a camera or having a counting system/clicker for the instructor to use would be helpful if the primary researcher is not on site. A related concern of videorecording technology is the notion

that the presence of video cameras can often influence behaviors if individuals perceive they are being recorded (Loy & Dattilo, 2000). While a camera adaptation period was included pre-study and the camera was mounted on riding helmets where they were not always visible to participants, their presence still may have impacted behavior. Researcher notes and discussions with THR instructors suggested there was not a significant influence, other aspects of the camera may have affected behavior results. Errors within operation of cameras occurred resulting in some missing data, disruption in sound occurred, unknown overuse of memory cards resulted in recording errors, and ability to observe all behaviors at times had limitations. Having a backup plan or ability to collect data if these occur would be recommended in future studies. For example, using a side walker with a camera or having a counting system/clicker for the instructor to use would be helpful if the primary researcher is not on site.

Finally, the structure of the study may have been a limitation. For example, the use of single subject design (SSD) lacks external validity due to the small sample size (Neuman & McCormick, 1995). It should also be noted that this study was limited by the program of the partner THR agency. Other research has suggested using significantly longer THR program durations to promote effectiveness (Anderson et al., 2019). Finally, it could also be questioned that participants knowing at some point within the 3-segment session that they would be doing token reinforcement and this awareness may have caused behavior overlap between treatment conditions. Even though session order was determined randomly, there may have been subtle mentions by instructors that token reinforcement sessions would be next and alluded to this condition being related rewards. Ensuring proper training by instructors when teaching behavior management is important to ensure there is nott a higher value of one condition over the other.

It could be discussed if the participants knowing at some point within the session, they would be doing token reinforcement did that cause any behavior overlap. Even though session order was determined randomly there was some prompting by instructors that token reinforcement sessions would be next and alluded to this condition being related reward. Ensuring proper training by instructors when teaching behavior management is important to ensure there is not a higher value of one condition over the other.

Future Research

There is a lack in evidence-based practice in THR and continuing further research will increase the efficacy of services. Research is needed in areas of creating and implementing specific protocols and a progressive curriculum across all participants within their goal area. Development of a standards of practice would be beneficial in creating a standardized treatment for building evidence-based research in the field of EAT. For the current study, future research should consider having a baseline and researcher interviews with potential participants that might include pre-assessment information. As mentioned earlier, examining the impact of these types of approaches on negative social skills would be beneficial to the scope of social skill development in children with disabilities. Another research approach would include examining the use of riding skills to strict ground training to determine what attributes of THR might be most beneficial in changing social skills. Finally further investigation into the use of high value and lower value reinforcers would provide a clearer understanding of the strength of target reinforcers.

Implications for RT Practice

Based on this study, it is important for professional in THR practice to pursue partnerships and collaborations with a RT. The use of the APIE process would be beneficial in

the development of EAT programs. Assessment allows for the participants to be place in the appropriate programs as well as assess the progress being made (*DAP, n.d.*). Implementation of structured protocols will additionally ensure that the programs are operating continually with consistent procedures for better tracking or evidence-based practice. Evaluation of program and staff performance to make sure programs are performing to meet established goals will also increase positive results with participants. With stated challenges and vulnerabilities, recording therapy/intervention sessions could be beneficial to building better sessions for the participant, gathering data, and promoting staff development.

Finally, PATH international certification only recognizes registered *therapy* components for physical therapists, occupational therapist, occupational therapy assistants, and physical therapy assistants. It is important for recreational therapists to become part of this recognition and certification option as RTs are equally and often more fully trained in physical and cognitive interventions not offered to other allied health professionals. There currently is not a requirement in the PATH CTRI certification for experience or educational background in cognitive or physical disabilities interventions. THR instructors would benefit from additional training during the certification process as well as during continuing education specific to common diagnoses present in sessions.

Conclusion

As discussed throughout this manuscript, token reinforcement remains a strong and viable intervention/condition with many strengths and criticisms. However, visual cueing for social skill development also provided evidence for effectiveness. Each approach has merit and more importantly were effective in conjunction with therapeutic horseback riding. THR and applied behavior analysis are both recognized in previous research separately to increase social behaviors. However, health providers, and specifically THR personnel, should consider combining THR with behavior management interventions to provide more options to positively impact the lives of children with ASD. More research is still needed in using these techniques together, as well as creating a curriculum that incorporates applied behavior analysis into the therapeutic riding curriculum.

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SECTION II: EXTENDED LITERATURE REVIEW

Autism and Social Skills

Autism Spectrum Disorder (ASD) is a developmental disability that lacks social communication and is referenced when discussing about social skills building (NIDCD, 2020). The range of conditions with autistic characteristics are called ASDs and are defined by a pattern of behavioral deficits. One of the primary core features includes severe limitations in social reciprocity and communication (Lord & Risi, 1998). Due to the ability to reciprocate social exchanges between two individuals is critical to the social communication process, individuals with ASD are often challenged in social scenarios (Yuan & Chen, 2020). Furthermore, the inability to participate in these social exchanges is often attributed to typical ASD characteristics such as poor eye contact, failure to initiate social interaction, presence of atypical mannerisms, and impaired speech (Matson et al., 2007).

Individuals with ASD, also display deficits in imitation skills that peers without disabilities have acquired (Nelson et al., 2011). As a result of this, individuals with ASD often have difficulty forming relationships and communicating with others with and without disabilities (Brady et al., 2016). Children with ASD also can display a decreased preference and orientation to social stimuli, lack of interest in social activities, deficits in reciprocal social interactions, and difficulties in social situations (Supekar et al., 2018). As such there is an important need to assist in the development of social skills to ensure quality of life for these individuals. Approximately 26% of adults with developmental disabilities, including those with ASD, lead an isolated and less productive life, with a lack of friends and little engagement in occupational, vocational, or recreational social activities (Cederlund et al., 2008). Individuals with ASD often experience poor quality of life that is often related to impaired social skills and

poor social cognition (Howlin et al., 2004) that ultimately can create a lack of peer relationships thus resulting in loneliness that can increase chances of additional mental health problems (Laugeson et al., 2015). Since there is no apparent cure for ASD, the use of behavioral, biological, and educational interventions is vital for the development of social skills and positive outcomes (Nelson et al., 2011). Applied behavior analysis (ABA) therapy is one such technique that is often used to help children with disabilities develop social skills (Autism Speaks, 2022).

Applied Behavior Analysis and Social Skill Development

ABA Therapy is a method that uses behavioral reinforcement and conditioning to increase behaviors that are helpful and decrease behaviors that are harmful (Ithriyah, 2018). There has been an increase in the use of ABA to assist those with ASD in attempts to improve their quality of life and daily activities (Autism Speaks, 2022). ABA can assist in the development of life and social skills such as listening, observing, and imitating. As well as more in-depth skills such as social networking and understanding in children with ASD (McKeel et al., 2015) and has shown to be most effective when used earlier in a participant's life (Nelson et al., 2011).

The common principle of ABA is based upon Skinner's Operant Conditioning Theory (Murphy & Barnes-Holmes, 2009). This theory states that individuals learn and change behaviors through an interaction of antecedents (e.g., what happens *before* a behavior), behaviors (e.g., a person's response or lack of response to the antecedent), and consequences (e.g., what happens *after* the behavior) (Skinner, 1978). The consequence often includes the using positive reinforcement where the accomplishment of the desired behavior is rewarded by compliments, treats, positive feedback, or advancement (Ithriyah, 2018). The positive reinforcement then strengthens the behavior and promotes a change in a positive direction of the target or desired

behavior (Miltenberger, 2008). Scattone and Billhofer (2008) used ABA with reinforcers to teach skills called mands to a nonverbal child with ASD. The term "mand" comes from Skinner's *Verbal Behavior* (1957), whereas a *mand* is defined as a "verbal operant where the response is reinforced by a characteristic consequence and is under the control of relevant conditions of deprivation or unresponsive stimulation" (Scattone & Billhofer, 2008, p. 78). Carr and Durand (1985) stated that with differential reinforcement (e.g., reinforcing a specific response by eliminating other responses), severe behaviors are reduced. Similarly, Derby, Wacker, and Asmus (1997) reported that if a child is provided with an alternate form of communication to obtain identified reinforcers, it is more likely that appropriate social behavior increases in on going social behaviors correlated with a decrease in perseverative verbalizations (M=17% ; range 0% to 42%). This research supported increasing social behavior through the reinforcer/behavior relationship. While there are many types of ABA approaches, the researcher will use two behavioral reinforcement techniques will be used in this study.

The first ABA approach of interest in this study is a *token reinforcement* modality where a type of positive reinforcement is provided to children as a reward or token for demonstrating a target behavior (e.g., obeying a set of regulations) (Alqahtani, 2020). Alqahtani used an observational behavior checklist to determine the dominant disruptive behaviors in a classroom of 40 children with disabilities. Then he implemented a token reinforcement (TR) intervention was implemented to determine if he could reduce dominant disruptive behaviors among students. Alqahtani determined that the TR system decreased all eight disruptive behaviors and specifically, disorderly conduct behaviors decreased by 34.7% in girls and 47% in boys.

The second ABA approach used in this study is visual cues (VC). VC have been used in the form of images, written words, or a combination of both to teach social skills to people with

ASD (Autism Speaks, 2022). Due to children with ASD often struggling to understand and follow spoken instructions, they frequently exhibit frustration and problem behaviors resulting from difficulty communicating (NIH, 2020). Finally, some children with ASD are anxious or act out when their routines change, or they are in unfamiliar situations (Rodriguez & Thompson, 2015). To avoid such emotional reactions, visuals can promote appropriate and positive ways to socially communicate. VC can help participants understand what to expect to reduce anxiety. VC can also help children with developmental disabilities with paying attention to important details and helping cope with change. In a study by Ganz (2008), social stories and scripts were presented as visual cues to increase social communication in children. The study examined the number of scripted responses from three participants where participants demonstrated an increase of scripted responses ranged from 0 to 2, 3 to 18, 8 to 15 among participants during the intervention. In another study, Argott (2008) used both textual social cues and TR to teach adolescents with ASD how to respond to nonverbal cues with an appropriate empathic question or comment such as asking, "Is something wrong?" in response to a specific nonverbal cue of pain. While ABA has been a common strategy for promoting social skills in children with ASD, the use of ABA in combination with THR addresses deficits in social skills as a more novel approach.

Therapeutic Horseback Riding and Equine-Assisted Therapy

THR often has several different names including equine-assisted therapy, hippotherapy, and on a competitive level, and para-equestrian (White-Lewis, 2019). Throughout history, the horse has been recognized as an agent of healing for minds and bodies. The ancient Greeks, who were the first to recognize the horse's therapeutic effect, offered rides to individuals to treat incurable illnesses and elevate an ill individual's mood (Bizur et al., 2003). THR is a broad term

that refers to interventions with horses, whether it is with the movement of riding, grooming, tacking, or just interaction to meet sensory, cognitive, or motor skills goals. To help clarify these many forms of using horses, the following section will differentiate the many terms representing the use of a horse as a therapeutic intervention.

The industry of equine-assisted activities and therapies (EAAT) recognizes two broad categories of interventions: equine-assisted activities (EAAs) and equine-assisted therapies (EATs) (McDaniel Peters & Wood, 2017). PATH International (2015) defines EAAs as specific activities involving the clients, volunteers, instructors, and horses of equine centers. For example, different types of EAAs include, among others, TR, equine-assisted learning, therapeutic vaulting, stable management, or the use of ground activities such as tacking or grooming horses (McDaniel Peters & Wood, 2017). It is common for allied health therapists to provide the EAT of hippotherapy (HPOT), whereas psychologists, social workers, and other mental health professionals commonly provide the EATs of equine-assisted psychotherapy or counseling (American Hippotherapy Association, 2017; PATH Intl, 2017). Across different types of EATs, health professionals incorporate horses in ways that help meet clients' goals and needs in accordance with the practice standards of their professions (McDaniel Peters & Wood, 2017). Appendix H clarifies the interrelationships of the types of EAA and EATS. To promote the specialty of therapeutic riding accurately, it is vital that PATH Intl. Certified Instructors caution how they communicate and represent the activities they offer (Buckley et al., 2019). A certified instructor should avoid describing their program as "equine therapy" or "riding therapy." If the certified professional is not also a licensed therapist trained to incorporate equines into their practice, they should be careful not to describe services as hippotherapy or EAT (Buckley et al., 2019).

Use of Therapeutic Horseback Riding to Promote Social Skills

THR as a treatment is gaining popularity among therapists working with children with developmental disabilities (i.e., autism and Down syndrome) as there are currently more than 860 THR centers in the United States (PATH, 2015). Animal-assisted therapy, specifically equine-assisted activities, can provide a multisensory environment that has been found to positively impact social motivation, sensory processing, inattention/distractibility, irritability, and overall social function in children with social and communication deficits (Bass et al., 2009). Bass et al. (2009) evaluated participants (N=19) in a 12-week THR program with a system of mounting/dismounting, exercises on the horse, riding skills, mounted games, and horsemanship skills with each addressing specific therapeutic outcomes. For example, Bass suggested that mounting activities stimulated verbal communication, proprioception, and vestibular processing. The riding skills portion worked on language, gross motor, fine motor, sensory seeking, balance, and coordination and the mounted games focused on social communication, gross motor, fine motor, and coordination. Finally, the horsemanship lessons promoted verbal expression through the responsibility of caring for the horse. Using pre/post-tests of participant's sensory profile and the social responsiveness scale, participants in the THR experimental group demonstrated significant differences (p < 0.05) between pre/posttest social response and social motivation scores for the experimental group [$t(13) = 3.93$, $p < .003$], but not for the control group (p>.05). Bass suggested that the increase in social functioning resulted due to the exposure to the horse was socially stimulating because of the physical presence or natural movement of the horse. In addition, the natural heat of the horse's body temperature allowed the rider's body to relax and feel the movement. In addition to psychosocial outcomes, physical outcomes result from THR as the interaction with the horse demands increased active and physical engagement. In addition,

participants demonstrated increased and sustainable levels of attention, with pre and post-scores decreasing in a therapeutic direction by 4.7. Scores attributed to the highly structured interventions requiring listening to directions, verbalizing commands, and identifying shapes and horse anatomy appeared to provide participants a direct level of involvement throughout lessons that repeat social skill development.

Similarly, Ward (2013) examined scores from the Gilliam Autism Rating Scale (GARS-2) and Sensory Profile School Companion (SPSC) to determine the effect of THR interventions on social communication and sensory processing of individuals with autism. Their teacher evaluated participant behaviors in the school setting after participating in THR lessons. This study differed from Bass (2009) in examining if acquired social skills were maintained without THR. While fewer characteristics of ASD were present *during* THR (as represented by scores on the GARS-2), the presence of behaviors associated with autism *increased* (p = .05) during the period *without* THR.

Gabriel's et al. (2018) examined the long-term effect of THR on hyperactivity, irritability, social, and communication behaviors in youth with ASD. This study differed from previous research because it followed up six months after participants departed the 10-week program. Participants (N = 96) were assigned to groups with horse contact and no/limited horse contact. Primary caregivers then completed the Irritability and Hyperactivity subscales of Aberrant Behavior Checklist - Community (ABC-C) and the Social Responsiveness Scale (SRS) to evaluate change in target behaviors. Assessments taken after the completion of the THR program revealed significant improvements in the THR group compared to the control on measures of irritability ($p = .02$) and hyperactivity ($p = .01$). Significant improvements in the THR group were also observed on a measure of social cognition ($p = .05$) and social

communication ($p = .003$), along with the total number of words ($p = .01$) and new words ($p = .01$) spoken during a standardized language sample. While there seems to be some evidence that THR promotes social skills in children with developmental disabilities, there remains some uncertainty if THR is uniquely making this change (Dawson et al., 2022). Could these improvements result from proven applied behavior analysis techniques incorporated within THR?

Using Therapeutic Horseback Riding and Applied Behavior Analysis to Promote Social Skills

There is minimal evidence of token economy and visual cues with therapeutic horseback riding (THR); however, one similar ABA technique used with THR is *differential reinforcement*. Differential reinforcement is a strategy used in applied behavior analysis (ABA) to address challenging or undesirable behavior, usually in children where target behaviors are reinforced and unwanted behaviors are ignored or unrewarded (O'Donohue & Fisher, 2009). O'Donohue and Fisher (2009) indicated several techniques are used in differential reinforcement, but the goal is always the same: to encourage appropriate behavior by giving or withholding reinforcement. The theory behind differential reinforcement is that people tend to repeat behaviors that are reinforced or rewarded (like token reinforcement) and are less likely to continue behaviors that aren't reinforced (O'Donohue & Fisher, 2009). Differential reinforcement for communication behaviors has been demonstrated to improve communication in children with ASD (Goldstein, 2002). McDaniel (2015) suggested the use of the horse in THR provides differential reinforcement by either doing what the child asks (i.e., walking, trotting, halting) or not, depending on the quality of the child's communication. For instance, when the child says "walk" the horse walks, providing an immediate reward for the child's successful communication.

Nonverbal communication can also be reinforced, such as squeezing the horse with their legs to transition from a walk to a trot. The type of communication required of the child can also be manipulated by the THR instructor depending on the individual goals for each participant (McDaniel, 2015). For example, if the participant has a goal working on asking permission before doing a task, the instructor can require that the child ask "please?" before allowing the horse to walk.

Similarly, Zhao (2021) completed a 16-week study where each THR session followed the same routine including (a) warm-up activities; (b) riding skills and horsemanship skills instruction; (c) THR exercises and activities; and (d) cool-down and reward activities to build social skills. During sessions, each participant was asked to interact with the horse, respond to instructors (e.g., high-five instructors, say bye to the horse), and form new interactions while communicating with others (e.g., physical, verbal, or eye contact). When the participants followed the instructions and accomplished the activities in each session, it was determined that they had practiced and finished a brief socialization phase. Participants routinely performed the same series of activities and exercises to strengthen their riding skills and achieve their respective goals (goal-oriented) using visual cues (e.g., pictures, cards, colorful drawings) to help children understand clearly what they should do next. At the end of the session, participants participated in "reward activities" (i.e., token reinforcement) that included high-fives and hugs as well as choosing from toys, stickers, or snacks (Zhao, 2021). After the THR intervention, a significant increase ($p < 0.01$) in social interaction scores was identified in the experimental group (Zhao, 2021). Results confirmed the potential role of THR as a practical complementary intervention approach for children with disabilities. With limited research using ABA in

conjunction with THR, there is undoubtedly a need to determine the strength and effectiveness of these interventions in promoting social communication in children with ASD.

Current Study

As stated in above literature the use of THR and ABA therapy have been found to be a positive intervention technique when working on social skill development in children with ASD. This study looked to create a partnership of both approaches to see if there would be an increase in receptive and expressive communication when adding ABA approaches such as visual cues and token reinforcement to the THR lessons. The use of ABA therapy reinforces the principles of learning and motivation from behavior analysis, as well as the procedures emerging from those principles, to find solutions to problems of social significance (Center for Autism & Related Disorders, n.d.). The purpose of these approaches and principles is to create meaningful and positive behavior change that could lead to more independence as well as positive social relationships in the future. The study will add more evidence-based research to continue the growth of both techniques used separately and together. The design of this study allows each participant to be analyze separately for each variable. Continued research may lead to other partnerships with THR to improve the social skill building of participants with ASD.

SECTION III: EXTENDED DISCUSSION

Discussion

The current study examined if the use of behavior management approaches used in conjunction with therapeutic horseback riding increased the frequency of social communication skills. The research questions for this study examined which treatment method performed best at improving the frequency rate of receptive social skills and the frequency of expressive social skills in children. The study is not meant to say or in way prove that THR on its own isn't an effective intervention method but how incorporate these techniques which through literature and evidence-based research shows added success. Because of the added prompt with the use of the ABA techniques of visual cues and token reinforcement it could have been predetermined that either visual cues or token reinforcement would be higher than therapeutic horseback riding alone. From the findings of the study without the pre-stated notion that it is not trying to prove that THR isn't successful on its own, the findings would show that the intervention is weak in comparison to the others. However, if you examine the RSS and ESS of THR alone the participant does show increases in THR as each week is completed.

Strength of Token Reinforcement

Although there was increase in all conditions throughout the study token reinforcement was associated with the highest frequency rate percentage for receptive communication and the frequency count of expressive communication. For all four participants token reinforcement scored the highest, this could show that this condition is extremely strong at building social skills. Each participant had a mixture of themes included as "rewards" based on stated pre-study interests. The personalization of participant rewards most certainly strengthened the TR. Fiske et al. (2015) suggested that identifying and using token rewards that are meaningful to individuals

is critical to the strength of TR. Russell et al. (2018) the effects of token reinforcement relative to leisure reinforcement and found that reinforcers resulted in the highest average rate of responding, the highest break points were more frequently observed in the token-reinforcement condition. When examining the use of token reinforcement, the value of the reinforcer may play a part in the performance of the condition. Fiske et al. (2015) examined the assessment and value of the reinforcer to determine if a schedule was needed on what reinforcers are used. The primary or immediate reinforcer scored with a higher response from all participants (N=4). The current study method used token coins then after the lesson was over participants received reinforcer from "treasure box." In a study by Charlop-Christy and Haymes (1996), data was collected on children with autism to analyze the percentage correct of task responses and on the occurrence of inappropriate behaviors during sessions when using token reinforcement. Results of this study also indicated that percentage correct on task performance was higher when objects of obsession (high value) were used as tokens as opposed to when typical tokens (lower value) were used. The current study participants had an overall understanding of what happened with token reinforcement and even though the participants didn't have a certain number they had to meet, based on observational data from the videos the participants displayed more excitement and recognition during transition which could be recognized as a more intriguing to participants. Token reinforcement is an effective treatment but there is a balancing act to make sure that the participant isn't only motivated by the external motivator and that there is an internal motivator as well or a way to build that intrinsic motivation.

Elimination or "Fading" of Negative Social Behaviors

The design of this study did not account or track the negative behaviors that would be present during sessions or if the use of token reinforcement would have a lasting effect. For

example, "David" was very "expressive" during his sessions asking questions or talking off topic based on the portion of the lesson that was occurring. While the receptive portion allowed for instructors to prompt the correction of a behavior and if participant responded there was no calculation to separate if the receptive prompts were just directions for the next task of the horseback riding lesson or if it was for a behavior redirection. Having a calculation of negative or non-appropriate behavior occurrences within each condition would help track change of social behaviors in addition to the communication skills being observed. This is needed to ensure that participant is on task and able to respond with cues are given. Within the variable of expressive communication, a better definition or separation between expressive communication that would be positive versus negative would help determine if certain condition help in the change of that behavior. In the current study any self-prompted expressive communication whether it was on topic or off topic was counted. For two of the participants expressive behaviors was a lot higher with multiple occurrences per interval. For future studies in examining which applied behavior techniques is stronger having that separation would be helpful during analysis.

Behavior Management Training in THR

Equine assisted therapy (EAT) has been used as a treatment option for people with disabilities since the third century (Morgan, 2006). But because of the gap in training and knowledge of each disabilities population there are implementation inconsistencies and lack of support for interventions (McKissock et al., 2022). The center used in the study could be considered small since there are currently only two THR instructors. One instructor used in the study had previous experience outside of THR in the use of formal behavior management approaches, as well as working with children with ASD. The second instructor had extensive horse and instructor background but not the background needed for specializing with child with

ASD. According to the statistics given by the executive director of the agency at least 80% of their clients they currently serve has some form of intellectual and/or developmental disability. Due to a wide range of behaviors that can be seen in children with autism (e.g., delays in communication, lack of appropriateness, repetitive behaviors, rocking back, and forth) it is important as a provider of service to this population to have knowledge and training in successful interventions that may decrease behaviors and increaser skills (American Autism Association, 2020). Since intellectual and developmental disabilities such as autism are so complex and have different levels, as well as conditions that may also affect the person it is imperative that the instructors of studies understand the arrange and implication procedures. Identifying specific protocols when teaching socials skills using techniques of ABA should be used. The use of a standardized THR based programs such as "Galloping Towards Success" (McKissock et al., 2022) would add more evidence-based research in the field.

Study Limitations

Potential limitations occurred were both design and client-related. Alternating treatment designs require an increase amount of consistency within facilitating the interventions emphasizing the importance and criticality of procedural reliability (Neuman & McCormick, 1995). The truest control would be to examine THR without any form of reinforcement for demonstrating the target behaviors. Therefore, it should be notes that a form of token reinforcement can be verbal praise, it would be impractical, if not unethical, for the instructor to withhold verbal praise during the other sessions (THR & THR-VC). The creation a physical type of token reinforcement, such as a sticker or bracelet, was chosen to differentiate from any conscious or unconscious verbal praise provided during sessions.

Furthermore, environmental factors such as the weather were out of control of the researcher. In the case of inclement weather, indoor interventions such as grooming and sensory room activities were substituted by the instructor. There were two sessions that were moved indoor due to weather. Instructors followed same format and protocol in conducting lessons. The changes to the lesson could have altered the responses from participants if they were anticipating being able to ride the horse, but there was no decrease or differentiation in the layout and results. All participants continued throughout the entire study, however there were missing sessions which could have affected results since the duration of the study was limited. While every attempt was considered, make-up sessions was based on the availability of instructor, facility, horse, volunteers, and participant. Due to the limit in instructor and participant availability, it was decided by agency that missed sessions were not able to be rescheduled.

This study relied almost fully on technology to score the participants making it a limitation. The only information obtained without the use of technology were questions at the beginning of the lesson that were a part of the researcher's behavior journal. Because technology set-up and implementation is often complex, not all people are comfortable with it and it may not always capture the whole picture steps for use of technology should be detailed. For participant using the cameras didn't cause distraction that was planned for in the beginning, however there were other aspects of the camera usage that effected results. Errors within operation of cameras occurred resulting in some missing data, disruption in sound occurred, unknown overuse of memory cards resulted in recording errors, and ability to observe all behaviors at times had limitations. Having a backup plan or ability to collect data if these occur would be recommended in future studies. For example, using a side walker with a camera or having a counting system/clicker for the instructor to use would be helpful if the primary researcher is not on site.

The current study has a lack of external validity due to the fact that it worked solely within collecting data during therapeutic riding sessions. To potentially change this being able to conduct same type of sessions in a different location without the use of THR would be needed. Other aspects of the study that could have yielded different results and insights include the length of the sessions and the study itself, 7 sessions may not allow adequate time needed to change a behavior. The "Galloping Towards Success" pilot study was a 15-week program that showed increase in SRS-2 scores in 9 out of 10 participants. It could also be discussion if the participants knowing at some point within the session, they would be doing token reinforcement did that cause any behavior overlap. Even though session order was determined randomly there was some prompting by instructors that token reinforcement sessions would be next and eluded to this condition being related reward. Ensuring proper training by instructors when teaching behavior management is important to ensure there isn't a higher value of one condition over the other.

The current study did not account for the possibilities that there could be a negative social behavior after the prompt for receptive communication. Due to the fact that behaviors are not predictable for children with autism, if the participant was overstimulated or was not engaged in the game or session there is potential for prompt to result in a negative behavior. This negative behavior would then have to be prompted by another receptive communication mand. Another potential limitation is the instructor training for appropriate teaching methods when working with people with disabilities, not just individuals with ASD. Training through credentialing agencies focus on lesson structure, implementation, and working with the horse. There is only basic training in disabilities services for instructors. Recreational therapy and equine assisted therapy/

Therapeutic horseback riding are growing which will allow for more disabilities service/human service-related backgrounds in the field.

The study design did not include a baseline or pre-test to determine the client appropriateness for the current study. Study participants were chosen based on criteria of age, diagnosis, and need for social skills development. The use of a secondary measure or pretest would give a baseline of data to see if participants are closely related based on social skill levels, as well it will allow for an additional social skill measurement. In the study done by McKissock et al. (2022), the research team used the SRS-2 to assess social skills in the 15 week "Galloping towards Success" program.

Future Research

There is a lack in evidence-based practice where specific protocols are used and continuing and partnering with other studies will increase the results of THR. Research in areas of creating and implementing specific protocols and a progressive curriculum across all participants within their goal area is needed. Development of a standards of practice would be beneficial in creating a standardized treatment for building evidence-based research in the field of equine assisted therapy. For the current study future research should include having a baseline, researcher interviews with potential participants that might include pre-assessment. The use of a lesson protocol that would gradual change the in requirements for the participant to challenge the behaviors. Accounting for negative behaviors to see if the conditions work on increasing and decreasing the social behaviors. Redesigning this same study to be ground school only would be another way to analysis the strength of the conditions and if there would be a change in the best treatment results. In terms of continuing research in the area of applied behavior analysis rotating high value and lower value reinforcers each week in the box may give an accurate picture of the

strength in this condition. As well it might show potential decline if paired or used with a design that uses reverse treatment. Another option for future research would be a comparison between using these conditions with THR and having an additional group that has sessions without the use of THR or activities that used pictures or horse related activities without the presence of the horse.

Implications for RT Practice

Based on this study it is important for RTs in practice in this field or for professionals in this field to pursue the partnership and collaboration with a RT. The use of the APIE process would be beneficial in the development of equine assisted therapy programs. Assessment allows for the participants to be place in the appropriate programs as well as assess the progress being made. Implementation of structured protocols will ensure that the programs are operating on a continual basis that allows the same procedures to be followed and tracked for evidence-based practice. Evaluation of program and staff performance to make sure programs are performing to meet established goals will increase positive results with participants. Being able to record therapy/intervention sessions could be beneficial to building better sessions for the participant, gathering data, and for staff development.

Currently, PATH international certification only recognizes in their registered therapy component physical therapists, occupational therapist, occupational therapy assistants, and physical therapy assistants. It is important to the field that recreational therapists become part of this recognition and certification option as RTs are trained in physical and cognitive interventions, so there is more diverse background potential. There currently isn't a requirement in the PATH CTRI certification for experience or educational background in the cognitive or physical disabilities and interventions these instructors would benefit from additional training

during the certification process as well as during continuing ed on working more specifically with common diagnosis seen in the EAT sessions.

As mentioned in the participant profiles 3 of the participants had educational IEPs. Examining the IEP and knowing what other programs or interventions being done that could affect or collaborate with could help with building social skills. From a developmental standpoint, the focus of social communication will be important for the child's school success.

Conclusion

In research question one it was asked what treatment method (THR, THR with Token Reinforcement, or THR with Visual Cues) is best at improving the frequency rate of receptive social skills in children with ASD?. For second question, it was asked which method was best at improving the frequency of expressive social skills in children with ASD. These questions were answered with token reinforcement. As discussion in the literature and discussion, token reinforcement is a strong intervention/condition. Token reinforcement to the participant could seem like another game in addition to the patterns or games already taking place during the sessions. Therapeutic horseback riding and applied behavior analysis are both recognized in studies to increase social behaviors and combing both interventions allows instructors to have more options to change the format of lessons with additional cues. More research is still needed in using these two techniques together, as well as creating a curriculum that incorporates applied behavior analysis into the therapeutic riding curriculum.

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<center>**Appendix A**</center>

<center>**Procedural Reliability Checklist**</center>

ADMINISTRATIVE PROCEDURES	Yes	No	Comments
Participant arrives min. 15 minutes before lesson			
Instructor greets rider			
Rider gets helmet			
Rider wearing proper footwear			
Rider dressed for weather conditions			
Rider wearing safety belt			
	Yes	No	
Camera one attached to participant's helmet			
Camera one checked security and correct view after mounting			
Camera on Instructor mounted on hat			
Camera on instructor checked in arena			
Sound check in arena			
Press record on video app			
Intervention goal stated			
	Yes	No	
Is the same horse being used?			
Is the same instructor teaching?			
Are the same volunteers assisting?			
Any changes at home or school this week?			
Any environmental distractions?			
	Yes	No	
Safety check includes steps below			
environment, arena, horse, equipment, rider's posture, clothing, volunteers			
check horse tack/ tighten girth to ensure saddle is secure			
check rider's helmet to make sure it is tight and secure so that the camera stays in position			
Gates closed			

INTERVENTION PROCEDURES	Yes	No	
THR Session			
Same lesson plan and games used			
Clear instructions given			
Limited crossover from other sessions (no cuing or items given for reinforcement)			
Total intervention time used			
Any session differences?			
Instructor stayed within ___ feet of participant to ensure adequate recording of camera two.			
Summarize at end if session			
THR- VC Session			
Same lesson plan and games used			
Clear instructions given			
Limited crossover from other sessions (no cuing or items given for reinforcement)			
Total intervention time used			
Any session differences?			
Instructor stayed within ___ feet of participant to ensure adequate recording of camera two.			
Summarize at end if session			
THR-TR Session			
Same lesson plan and games used			
Clear instructions given			
Limited crossover from other sessions (no cuing or items given for reinforcement)			
Total intervention time used			
Any session differences?			
Instructor stayed within ___ feet of participant to ensure adequate recording of camera two.			
Summarize at end if session			
_____			
States goals at beginning of session			
Games and lessons were appropriate for participant skill level			
One minute break after session 1 and 2 for transition			

VIDEO RECORDING PROCEDURES	Yes	No	Comments
Camera one attached to helmet of participant			
Sound and picture check completed			
Camera two attached to hat of instructor			
sound and picture check completed			
Camera one and two press record in app as participant enters mounting ramp			
Camera one video check when participant exits mounting ramp on horse			
Camera one and two video and sound check before lesson starts in arena			
Cameras one and two check at end of intervention			
Stop recording after participant dismount			

Assent Form
Things You Should Know Before You Agree To Take Part in this Research

_____

IRB Study #_____

Title of Study: Comparing the Effectiveness of Social Skill Development Interventions with Therapeutic Horseback Riding in Children with Autism:
An Alternating Treatment Design

Person in charge of study: Lauren Harrell, LRT, CTRS, CARSS I
Where they work: Graduate Student at ECU
Other people who work on the study: Dr. David Loy, PhD., LRT, CTRS, CARSS I

Study contact phone number: (252) 414-4173
Study contact E-mail Address: harrellla07@students.ecu.edu

People at ECU study ways to make people's lives better. These studies are called research. This research is trying to find out how therapeutic horseback riding helps build social skills.

Your parent(s) needs to give permission for you to be in this research. You do not have to be in this research if you don't want to, even if your parent(s) has already given permission.

You may stop being in the study at any time. If you decide to stop, no one will be angry or upset with you.

Why are you doing this research study?
The reason for doing this research is to help you meet your goals and build positive communication skills to use at school and/or home.

Why am I being asked to be in this research study?
We are asking you to take part in this research because we are working with Rocking Horse Ranch and their goals that they have established with you and your parent/guardian are the same as the study.

How many people will take part in this study?

If you decide to be in this research, you will be one of about four people taking part in it.

What will happen during this study?
       Check the line that best matches your choice:
       _____ OK to record me during the study
       _____ Not OK to record me during the study

This study will take place at Rocking Horse Ranch Therapeutic Riding Center and will last 12 weeks.

Who will be told the things we learn about you in this study?
The only people who will have access to the study information are myself, my education team, ECU research team (IRB), Executive Director at Rocking Horse Ranch, and the instructor of your lessons.

What are the good things that might happen?
Sometimes good things happen to people who take part in research. These are called "benefits." The benefits to you of being in this study may be building new friendships, learning new skills, and completing the program.

Will you get any money or gifts for being in this research study?

You will receive certificate of completion for being in this study.

Who should you ask if you have any questions?
If you have questions about the research, you should ask the people listed on the first page of this form. If you have other questions about your rights while you are in this research study you may call the Institutional Review Board at 252-744-2914.

If you decide to take part in this research, you should sign your name below. It means that you agree to take part in this research study.

_____   _____
Sign your name here if you want to be in the study   Date

_____
Print your name here if you want to be in the study

_____   _____
Signature of Person Obtaining Assent   Date

_____
Printed Name of Person Obtaining Assent

Appendix C
Consent Form

Dear Parent of Participant,

I am a graduate student at East Carolina University in the Recreation Sciences department. I am asking you to take part in my research study entitled, "Comparing the Effectiveness of Social Skill Development Interventions with Therapeutic Horseback Riding in Children with Autism: An Alternating Treatment Design."

The purpose of this research is to examine the relationship between therapeutic horseback riding and behavior management and how they can be used to build social skills in children with autism. In doing this research, I hope to learn which method (therapeutic riding, therapeutic riding with token reinforcement, or therapeutic riding with visual cues) is best at improving the frequency rate of social skills in children with autism. Your participation is completely voluntary and may stop at any time.

You are being invited to take part in this research because identified by Rocking Horse Ranch as a participant in their program that meets the study guidelines. The amount of time it will take you to complete this research is the same as your regular scheduled session with Rocking Horse Ranch, one session a week for the duration of the fall session.

If you agree to take part in this research, you will be asked to participate in your normal RHR sessions, the difference will be that these sessions will be recorded so that observers will be able to count social behaviors.

This research is overseen by the ECU Institutional Review Board. Therefore, some of the IRB members or the IRB staff may need to review my research data. Your identity will be evident to those individuals who see this information. However, I will take precautions to ensure that anyone not authorized to see your/your child's identity will not be given that information.

If you have questions about your rights when taking part in this research, call the ECU University & Medical Center Institutional Review Board (UMCIRB) at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director for Human Research Protections, at 252-744-2914.

Again, you do not have to take part in this study and you can stop at any time. If you decide you are willing to take part in this study, continue with the survey below. You can return this form to the Executive Director of RHR.

Thank you for taking the time to participate in my research.

Sincerely,
Lauren Harrell, LRT, CTRS, CARSS I, Principal Investigator

_____

Participant's Name (PRINT)   ***Signature***   ***Date***

Parent/Guardian Name (Print)   ***Signature***   ***Date***

Appendix D Lesson Plans

Date & Instructor:

Short & Long Term Goals:

Objective of Lesson: (include riding skill, action, measurement, conditions)

Teacher Preparation/ Equipment Needed:

Rider	Horse	Tack	Leader	Side walker 1	Side walker 2

Ring set up (Draw arena setup)

Prep volunteers before lesson

1. Greet Student, Pre-lesson activities or exercises - Safety Check

2. Mount - order, type, assistance - Safety Check & Stirrups

3. Warmup & Review - Safety Check

4. Teach New Riding Skill

    o What

    o Why

    o How

    o Where

5. Practice

6. Progression/Activity

7. Cool Down and Wrap Up

8. Dismount - order, type, assistance

9. Thank volunteers and horses

10. Rest if needed

Progress Notes: (for each student: strengths, weaknesses, if objective was met, suggestions for next time)

Self-Evaluation: (strengths, weaknesses, what you would have done differently, suggestions for next time)

Lesson Plan for Walk Halt Transitions

Set up

- 8 cones - 2 pairs of cones set up on each quarter line (so the rider will turn down the quarter line, halt between the cones, walk on, halt between the next cones, walk on - leave enough room for them to turn back on to the rail or reverse at the end)
- stop/go sign

Lesson Plan

- Tack Check
- Mount
- Tack check
- Warmups
    - backward arm circles 10x - to open up the chest, establish balance, warm up the shoulders and arms
    - "row boats" 10x (straighten arms in front of you, then bring hands to pockets, keeping thumbs up) - to prepare for halt rein aid action
    - no stirrups, ankle circles, 10x - to warm up ankles to help get heels down
    - Reverse directions across the diagonal - check posture from front and back
    - Repeat same 3 warmups the other direction
- Halt facing the instructor - each rider turns down a quarter line and halts between the cones
- Tack Check
- Review: Walk On
    - First Body - lighten your seat by breathing in, put reins forward a little
    - Second say "Walk On" - our horses know verbal cues
    - Last use legs - squeeze with calves, without rocking your seat
- Skill: Walk-Halt Transitions
    - What: stopping our horse
    - Why: to give him a break/reward, to rebalance yourself, to improve the horse's focus on you
    - How:
        - Look straight ahead and stay balanced, even weight on both seat bones
        - First Body - stop your body from moving with the horse by stiffening your lower back and tummy
        - Second say "Whoa" - drops your weight
        - Last use Reins - stopping your body also resists against the reins and should work, but the horse may need you to bring the reins back a little until he figures it out
    - Where: let's practice a few times down the quarter line in a straight line, then we'll play a game
- Practice down quarter lines
    - halt and walk on several times each
    - give them a visual to look at straight ahead
    - give feedback
- Activity: Red Light, Green Light
    - down the quarter lines 2x - at the end of the quarter line have them reverse directions to play again, or turn onto the rail and walk back to the beginning
    - play using verbal "red light" and "green light," or use stop/whoa sign

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- o if they don't stop right away, however many steps they take is however many seconds they must wait before walking on when it's a green light again
  - o continue to give feedback
- Progress: Halt between cones
  - o down the quarter lines 2x, between the cones (4 halts in all)
  - o Now that you've practiced halting in different places in the arena, let's practice halting in very specific places. We're going to halt so that your body is directly between the cones. This means you're going to have to plan when to start halting, because a horse has 4 legs and it takes a while for all of them to stop. So you might need to start halting when the horse's nose reaches the cones, so that by the time he actually stops, your body is between the cones.
  - o If they don't stop exactly in the cones, discuss whether to step forward or backward to get in the right place.
- Progress: anytime during the lesson take away support as able (unclip, take away side walkers, etc.)
- Cool Down:
  - o hands on hips for 1 lap - give arms a break, focus on balance
- Review:

Shapes Pattern

This entry was posted on September 22, 2013, in Games, Patterns and tagged Games, Patterns.
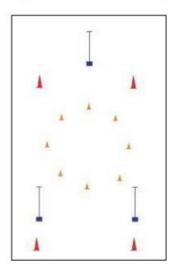
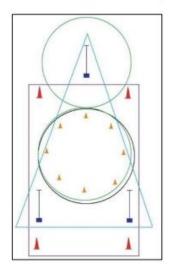Here is a simple game I did a few weeks ago. It can be modified in a million ways!
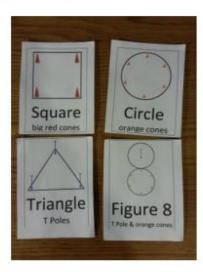
Props:

- 3 upright or T poles in triangle
- 4 tall cones in square
- 8 small cones in circle
- 4 cards depicting the shapes to be made around the items

Arena setup should be as follows, with spacing to fit the 4 shapes: square, circle, triangle, and figure 8. I made the cards below. You can download the pdf on my blog here:
http://lessonsintr.files.wordpress.com/2013/09/ride-the-shapes-game-cards.pdf

Activity:

- Whoa facing the props.
- Explain we are going to ride the shapes to work on … (whoa, steering, precision steering, looking through turns, bending, etc.)
- Hold up the cards and let them pick one.
- Work on reading, identifying the shape, identifying where the shape's props are, etc.
- Ride!
- Repeat!
- Progression can include riding without a leader, less verbal prompts, riding all the shapes in a particular order, etc.

Appendix E
Example Lesson Games

Ball Toss

- Place targets on the ground with different numbers. Give riders balls to toss at the targets from a designated distance away at a designated speed (halt or walk). Keep score per individual or as teams. You can play over several lessons to encourage riders to set goals and beat their personal best.

Bean Bag Balancing

- Place a bean bag somewhere on the rider's body: helmet, between arm and side, between leg and saddle, etc. – remember to get their permission. Ask riders to perform various movements with the goal of not dropping to bean bag. The last rider to still have their bean bag wins.

Bean Bag Toss

- Toss bean bags into hula hoop or baskets. Whoever gets the most in wins.

Build a Farm

- Cut a farm scene from felt and make a felt board, or use a magnetic farm set. Give riders different pieces. They must place them on the scene in a logical sequence.

Dice Game

- Riders line up at one end of the arena and take turns rolling the dice. They add up the numbers and walk that number of steps. You can make it a team game and have each team take turns rolling the dice and walking, so that the team that reaches the other end first wins.

Dismount Race

- At end of lesson, riders go to the far end of arena, turn the same direction to face the start/finish line, halt, dismount correctly, run up their stirrups, thank their volunteers and horses, the first to finish wins

Excavation Hunt

- Fill a pan with sand and objects (such as bones for an excavation hunt). Riders dig up the number of objects requested.

Hats Game

- Each rider chooses a hat to put on over their helmet. Have them take it off, put it back on, put it on their arm, put it on her leg, and so on, to practice balance and following directions.

Hokey Pokey

- Play the hokey pokey on horseback, while lined up or in a circle facing the instructor. Work on verbal skills, identifying body parts, and rhythm. You can even include horse parts!

Laundry Game

- String up a clothesline painted into sections of different colors, and have a bucket of clothes pins and matching colored clothes for each rider. Each rider selects a clothes pin and one item of clothing, rides to the clothesline and hangs the clothing in the matching section, then returns for another piece. The first team to run out of clothes wins.

Matching Game

- Use sets of matching horse or educational objects such as grooming tools, riding equipment, shapes, balls, letters, numbers. Hide one of each pair around the arena, and keep the partner in a bucket. The rider chooses and item from the bucket, then rides around the arena to find the matching partner. You can let everyone win by finding the matching partner, or identify the winner as the first to find theirs.

Obstacle Race

- Create an obstacle course by placing objects all over the arena – include turns, changing directions, riding over poles, and so on. The riders must ride from the start line to the finish line, which can be from one end of the arena to the other, or from one spot back to the beginning like a racetrack. The first to finish wins.

Relay Games

- These are games that involve passing off something, such as changing horses or passing off a baton. You can set up points of the arena for the pass off, or have them ride from one end of the arena around the pole and back to pass off to the next rider. Whichever team makes it through all its members first wins.

Ride a buck

- The riders put a $1 bill under their thigh or seat and rides until they lose the dollar – the last one with theirs wins. You can include walking to one end of arena, reversing directions, walking or trotting back, and harder skills.

Rings over Poles

- From the start/finish line, the riders ride to a pole, place a ring over pole, then ride back to finish line. This can be individual or in a team relay race style.

Scavenger hunt

- Riders must find items on a list. The items may be theme oriented. This can be played on horseback or on the ground in the barn.

Shadow Tag

- Like regular tag, except "it" tags someone by making their horse walk on the shadow of the other horse Include counting by counting to 10 then calling "ready or not, here I come". Notes this game is best played outdoors in early morning or late afternoon when the shadows are long.

Simon Says

- Any movement preceded by "Simon Says" is repeated by the riders, or else they are disqualified.

Slow Race

- Game: whoever crosses the finish last wins. Their horses may not stop or circle. Use this game to practice using gentle rein and leg aids. It also lets slower riders have a chance to win a race.

Tack Race

- Put a pile of tack in one area. The riders must race to the spot and pick out a specific piece of tack. You can have them draw for which piece of tack they must get, or they must choose a piece of tack they can identify to you.

Traffic Game

- Place road signs, orange cones, and other traffic items around the arena as an obstacle course. The riders must navigate according to the items.

Treasure Hunt

- Make a treasure map with words or symbols the riders will understand. They must follow the map to find treasure at the end!

Horse Race Game

- Create race horses out of paper that are identified by number, letter, color, shape or markings. Put them in a designated spot in the arena. Riders are given a specific horse to collect, and race to the spot to get theirs. Or you can spread the horses out in the arena and the riders must collect all of one kind and put them in an envelope. For riders with limited vision, make the horses identifiable with puff paint.

Water Game

- Place empty buckets at one end of the arena, and buckets full of water at the other end, with cups next to the buckets of water. Each rider must use the cup to take the water from one bucket to the other until their bucket is full, or they run out of water and the rider with the most water in their bucket wins. This can be done as individuals or as teams.

Vegetables Game

- Put plastic vegetables in a bucket, and fill another bucket with sand. The rider must remove the plastic vegetables from the one buckets, name them, and "plant" them in the bucket with sand. The buckets can be close together, far apart, or with additional obstacles between them.

Appendix F: Behavior Analysis Checklist

Receptive Communication

Verbal response to task

Nonverbal response to task

Appropriate speech content (Saying please, thank you, you're welcome, showing appreciation)

Appropriate speech volume (is participant yelling?)

Appropriate facial affect (smiling, raised or scrunched eyebrows)

Appropriate motor movements (Is participant keeping hands still or are they stimming/flapping?)
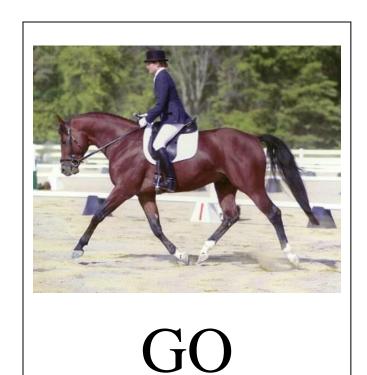
Following directions without prompts
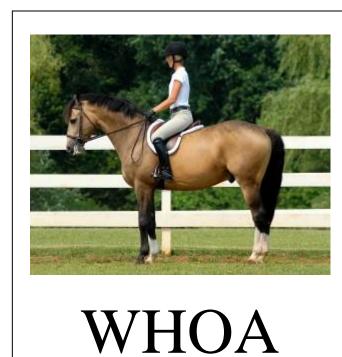
Expressive Communication
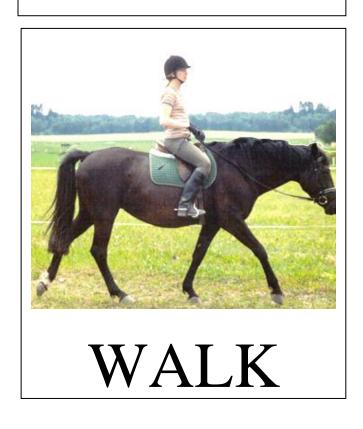
Initiating conversation

Gesturing (waving, pointing)

Facial expressions (Smiling, crying)

Vocalizations (crying, yelling, laughing)
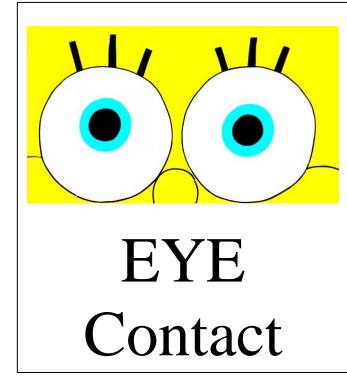
	Helmet On Mount Horse
	Walk to Horse Pet Horse
	Ride Horse/Walk On
	Stop Horse
	Feed Horse Treat
	Walk to Mom or Sister Helmet Off
Reminders: No running away. _____ Quiet Voice. _____ Listening Ears. _____ Gentle Hands-on Horse. _____ Working Hard. _____	_____

GO

WHOA

WALK

EYE
Contact

Appendix H Data Collection

Participant: Date:

Session type (circle one): THR   THR-VC   THR-TR   Instructor Antecedent

Behavior (circle one): Receptive   Expressive

Codes: + behavior did occur   — behavior did not occur

Interval	Behavior	Interval	Behavior
Example	(+) —	7.45	+ —
0.15	+ —	8.00	+ —
0.30	+ —	8.15	+ —
0.45	+ —	8.30	+ —
1.00	+ —	8.45	+ —
1.15	+ —	9.00	+ —
1.30	+ —	9.15	Transition
1.45	+ —	9.30	Transition
2.00	+ —	9.45	Transition
2.15	+ —	10.00	Transition
2.30	+ —		
2.45	+ —		
3.00	+ —		
3.15	+ —		
3.30	+ —	**Total %**	
3.45	+ —		
4.00	+ —		
4.15	+ —		
4.30	+ —		
4.45	+ —		
5.00	+ —		
5.15	+ —		
5.30	+ —		
5.45	+ —		
6.00	+ —		
6.15	+ —		
6.30	+ —		
6.45	+ —		
7.00	+ —		
7.15	+ —		
7.30	+ —		

Additional comments:
Note: Interval indicates whether or not the behavior occurred during a specified period of time.

Appendix I

Research Session Schedule

Week Number	Session Date	Phase	Intervention Order
1	October 4th- 6th	Comparison	VC, THR, TR
	Fall Break No Lessons		
2	October 18th -20th	Comparison	THR, TR, VC
3	October 25th- 27**th**	Comparison	VC, TR, THR
4	November 1st -3rd	Comparison	THR, VC, TR
5	November 8th – 10th	Comparison	TR, VC, THR
6	November 15th – 17th	Comparison	VC, THR, TR
	Thanksgiving Break No Lessons		
7	November 29th – December 1st	Comparison	TR,THR, VC
8	1-Dec-22	Best Treatment	TBA

Social Validity Survey

Researchers from ECU recently completed a study examining the effectiveness of behavior management approaches with therapeutic horseback riding in children with disabilities. This research was aimed at determining if therapeutic horseback riding alone OR in combination with behavior management techniques was most effective at promoting social communication in children with disabilities. As part of our expert panel for this study, ECU researchers would like to include your opinion on the social importance and accuracy of the study. Please answer the following questions by circling the number that BEST indicates your feelings and/or perceptions.

Check <u>ONE</u>:   I am ___ Parent/Guardian___ Agency Staff   ___ Volunteer

	Disagree		Agree		Strongly Agree
APPROPRIATENESS OF GOALS					
1) Increasing expressive and receptive social communication is an important goal for participants with disabilities.	1 2 3	4 5 6	7 8 9 10		
2) Learning which behavior management approach is best used with therapeutic horseback riding is important to investigate.	1 2 3	4 5 6	7 8 9 10		
APPROPRIATENESS OF PROCEDURES					
3) It is appropriate and meaningful to attempt to increase social communication skills in children with disabilities.	1 2 3	4 5 6	7 8 9 10		
4) It is appropriate to videotape therapeutic horseback riding sessions used with behavior management approaches and count the number of social communications to determine the best approach to help children with disabilities develop social skills.	1 2 3	4 5 6	7 8 9 10		
5) Video cameras are effective in capturing social skills of children with disabilities.	1 2 3	4 5 6	7 8 9 10		
IMPORTANCE OF FINDINGS					
6) _____ was found to be the best approach in this study to increase social skills (e.g., eye contact, initiating conversation, showing verbal appreciation). This is an important finding for children with disabilities and their parents.	1 2 3	4 5 6	7 8 9 10		
7) _____ was found to be the best approach in this study to increase social skills (e.g., greeting others, answering questions form others, making eye contact). This is an important finding for practitioners who work with children with disabilities.	1 2 3	4 5 6	7 8 9 10		

Appendix K

Agency Letter of Support & Permission

To Whom It May Concern:

I am writing this letter in support of the IRB application and thesis study submitted by Lauren Harrell. I understand that this project will involve Rocking Horse Ranch Therapeutic Riding Center, some of its participants, and it's horses. I understand the methods and design of the study to observe social skill behaviors of the participants chosen in the study. I understand that there will be minimal change to the routines of the instructor, horses, and participants.

I fully support this research study occurring at our site. Please do not hesitate to contact me if there are any questions regarding our cooperation with this project.

Sincerely,

Hannah Stocks

Program Director

Appendix L

Camera Information and Placement Diagram

(Young, n.d.)

(Camera mount diagram for camera one on participant)
(Young, n.d.)

Camera Information

AKASO Brave 4 Pro 4K30FPS Action Camera - 131ft Waterproof Camera with Touch Screen Advanced EIS Remote Control 5X Zoom Underwater Camera Support External Mic

4K30FPS Video/ 2" Touch Screen/ Dual Color Screens/ Electronic Image Stabilization 2.0/ 5x Zoom/ Adjustable View Angle/ Upside Down/ WDR/ Motion Detection Video/ Burst Photo/ Time Lapse Video/ Time Lapse Photo/ Self Timer/ Slow Motion Video/ Diving Mode/ Special Effects/ White Balance/ Loop Recording/ Driving Mode/ Audio Record/ Wi-Fi/ Micro USB/ Micro HDMI

(GP, 2011)

Appendix M

IACUC

ECU

Animal Care and Use Committee
003 Ed Warren Life Sciences Building | East Carolina University | Greenville NC 27834 – 4354
252-744-2436 office | **252-744-2355** fax

September 28, 2022

David Loy, LRT, CTRS, CARSS
Department of Recreation Sciences, ECU

Dear Dr. Loy:

Your Animal Use Protocol entitled "Comparing the Effectiveness of Social Skill Development Interventions with Therapeutic Horseback Riding in Children with Autism: An Alternating Treatment Design" (AUP#P112) was reviewed by this institution's Animal Care and Use Committee on 09/28/2022. The following action was taken by the Committee:

"Approved as submitted"

Please contact Aaron Hinkle prior to any hazard use

A copy of the protocols is enclosed for your laboratory files. Please be reminded that all animal procedures must be conducted as described in the approved Animal Use Protocol. Modifications of these procedures cannot be performed without prior approval of the ACUC. The Animal Welfare Act and Public Health Service Guidelines require the ACUC to suspend activities not in accordance with approved procedures and report such activities to the responsible University Official (Vice Chancellor for Health Sciences or Vice Chancellor for Academic Affairs) and appropriate federal Agencies. **Please ensure that all personnel associated with this protocol have access to this approved copy of the AUP/Amendment and are familiar with its contents.**

Sincerely yours,

[signature]

Susan McRae, Ph.D.
Chair Animal Care and Use Committee

SM/GD

enclosure

IRB Approval Letter

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
4N-64 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** ⊚· Fax **252-744-2284** ⊚·
rede.ecu.edu/umcirb/

Notification of Initial Approval: Expedited

From:	Social/Behavioral IRB
To:	Lauren Harrell
CC:	David Loy
Date:	9/26/2022
	UMCIRB 22-001652
Re:	Comparing Social Skill Development Interventions with Therapeutic Horseback Riding in Children with Autism

I am pleased to inform you that your Expedited Application was approved. Approval of the study and any consent form(s) occurred on 9/26/2022. The research study is eligible for review under expedited category # 6, 7. The Chairperson (or designee) deemed this study no more than minimal risk.

As the Principal Investigator you are explicitly responsible for the conduct of all aspects of this study and must adhere to all reporting requirements for the study. Your responsibilities include but are not limited to:

1. Ensuring changes to the approved research (including the UMCIRB approved consent document) are initiated only after UMCIRB review and approval except when necessary to eliminate an apparent immediate hazard to the participant. All changes (e.g. a change in procedure, number of participants, personnel, study locations, new recruitment materials, study instruments, etc.) must be prospectively reviewed and approved by the UMCIRB before they are implemented;

2. Where informed consent has not been waived by the UMCIRB, ensuring that only valid versions of the UMCIRB approved, date-stamped informed consent document(s) are used for

obtaining informed consent (consent documents with the IRB approval date stamp are found under the Documents tab in the ePIRATE study workspace);

3. Promptly reporting to the UMCIRB all unanticipated problems involving risks to participants and others;

4. Submission of a final report application to the UMICRB prior to the expected end date provided in the IRB application in order to document human research activity has ended and to provide a timepoint in which to base document retention; and

5. Submission of an amendment to extend the expected end date if the study is not expected to be completed by that date. The amendment should be submitted 30 days prior to the UMCIRB approved expected end date or as soon as the Investigator is aware that the study will not be completed by that date.
The approval includes the following items:

Name	Description
Assent Form- ECU.docx	Consent Forms
LHThesis Proposal 9-1-2022.docx	Study Protocol or Grant Application
Parental Consent Form 9-26-22.docx	Consent Forms
Recruitment Script.docx	Recruitment Documents/Scripts
Social Validity Survey.docx	Additional Items
Social Validity Survey.docx	Surveys and Questionnaires
Verbal Assent Script.docx	Consent Forms

For research studies where a waiver or alteration of HIPAA Authorization has been approved, the IRB states that each of the waiver criteria in 45 CFR 164.512(i)(1)(i)(A) and (2)(i) through (v) have been met. Additionally, the elements of PHI to be collected as described in items 1 and 2 of the Application for Waiver of Authorization have been determined to be the minimal necessary for the specified research.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

IRB00000705 East Carolina U IRB #1 (Biomedical) IORG0000418
IRB00003781 East Carolina U IRB #2 (Behavioral/SS) IORG0000418