# DOES THERAPEUTIC HORSEBACK RIDING IMPROVE SYMPTOMS IN CHILDREN WITH AUSTIM SPECTRUM DISORDER

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DOES THERAPEUTIC HORSEBACK RIDING

IMPROVE SYMPTOMS IN CHILDREN WITH

AUTISM SPECTRUM DISORDER

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Abstract: The purpose of this study was to determine if an 8-week therapeutic horseback riding program would decrease symptoms among children with ASD. The researcher hypothesized that the program would cause a decrease in the five subscales examined in this study: irritability, social withdrawal/lethargy, stereotypy, hyperactivity/noncompliance, and inappropriate speech. Participants in the study were parents of children age 5-18 with a current diagnosis of Autism Spectrum Disorder and planned to participate at a facility in a southwestern city in the U.S. Four participants of 5 children met the criteria and consented to participate. Participants completed a 58-item assessment, the Aberrant Behavior Checklist-Community, prior to starting and after their child completed the program. The assessment was used to evaluate the severity (on a scale of 0-3) of the observed behaviors of their child. Each item was associated with 1 of the 5 subscales in this study. The total of each item from the participants was used to assess the results of the study. Two non-parametric tests were used, the Spearman's Rho Correlation Coefficient and the Wilcoxon Signed Rank Test. Spearman's Rho was used to determine if there was a correlation between any of the subscales within the pre-assessments and again within the post-assessments. Wilcoxon was used to determine whether there was a change between the pre-assessment and post-assessment ratings. Within the pre-assessment subscales, statistically significant results yielded a very strong, positive correlation was found between Social Withdrawal/Lethargy and Inappropriate Speech ($r_s$ = .949, α = .026). The post-assessment subscales yielded, a very strong, negative correlation between Stereotypy and Hyperactivity/Non-compliance ($r_s$ = -.873, α = .005) and a perfect, positive correlation between Stereotypy and Inappropriate Speech. The results also yielded a statistically significant decrease in social withdrawal/lethargy (z = -2.864, α = .004) and a trend for increasing stereotypic behaviors (z = -.857, α = .063). Recommendations for future results include: larger sample size, recruiting parents of children participating for the first time, including race, gender, and socioeconomic status in the demographics, additional sessions each week and working with instructors to design interventions targeting the 5 subscales, contacting multiple facilities throughout the U.S.

TABLE OF CONTENTS

Chapter Page

# LIST OF TABLES

Table Page

# CHAPTER I

## INTRODUCTION

### Significance

Approximately 17% of children under the age of 18 are impacted by a developmental disability (Boyle et al., 2011; Johnson, 2009). One specific Developmental Disorder, Autism Spectrum Disorder (ASD), has been substantially increasing over the last 20 years in the United States and as many as 1 in 40 children currently hold the diagnosis (Kogan et al., 2018). This large number of diagnoses tops the combined number of children with cancer, juvenile diabetes, and pediatric AIDS (Jenkins & DiGennaro Reed, 2013). Children with ASD express deficits in social interactions and communication, and repetitive, stereotypical behaviors (Ward, Whalon, Rusnak, Wendell, & Paschall, 2013; Gabriels et al., 2011). In addition to the three core characteristics previously named, professionals listed three more common features including, behavioral issues, sensory and perception difficulties, and rigidity (Cascio, 2015). In a study by Horner, Carr, Strain, Todd, & Reed in 2002, it was found that children who show limited social interactions and communication development, namely those with ASD, have an increased risk for symptoms warranting intervention. Severe problematic behaviors that frequently occur in young children with developmental disabilities are self-injury, aggression, property destruction, pica, stereotypy, defiance, and tantrums (Gabriels et al. 2011; Horner, Carr,

Strain, Todd, & Reed, 2002). These behaviors not only inhibit their social development, but also their opportunity for gaining an education, ultimately impairing their quality of life (Horner, Carr, Strain, Todd, & Reed, 2002). They run the risk of becoming isolated from home environments, community integration, and current or future relationships (Horner, Carr, Strain, Todd, & Reed, 2002). The child is not the only one experiencing the effects of symptoms. Parents of children with ASD that express symptoms leading to problematic behaviors are at an increased risk for clinical depression and other mental illnesses. The parents may experience physical, emotional, and/or financial burdens that often lead to marital relationship stress (Hong, Kim, Lee, & Choi, 2018). It is important to find and utilize interventions that aid in the reduction of symptoms leading to problematic behaviors for the benefit of the child and their parents/caregivers (Barrett, 2019).

Although ASD has been, and continues to be thoroughly researched, the exact cause has yet to be determined. When a disorder is not completely understood, it makes it difficult to determine the best way for it to be treated and managed (Cascio, 2015). Professionals have different opinions when it comes to the gold standard for treatment of ASD, but one thing that most will agree on is, early intervention is crucial. Interventions used should target the specific symptoms of each child with ASD. According to the National Autism Center in 2015, there are fourteen established interventions for children under the age of 22.

- Behavioral Interventions
- Cognitive Behavioral Intervention Package
- Comprehensible Behavioral Treatment for Young Children
- Language Training
- Modeling
- Natural Teaching Strategies
- Parent Training

- Peer Training Package
- Pivotal Response Training
- Schedules
- Scripting
- Self-Management
- Social Skills Package
- Story Based Interventions

Literature suggests that interventions centered around communication and social skill building allow for more effective peer friendship development (Porter, 2015). This is beneficial because children with ASD are less likely to participate in activities and interact with others of the same age.

Further research is needed to determine if Animal Assisted Interventions (AAI) are beneficial for treating ASD symptoms. There are a few studies that support this idea and suggest that participation in AAI showed increases in social interaction and communication, and decreases in behavioral symptoms, ASD severity, stress, and isolation (O'Haire, 2012). Within AAI you will find Equine-Assisted Activities and Therapies (EAAT). Currently, EAAT, and more specifically Therapeutic Horseback Riding (THR), is an intervention that requires grooming and mounted riding activities is recognized as one of the most impactful AAI for children with ASD (Borgi et al., 2016).

**Purpose**

The purpose of this study was to determine if an 8-week THR program would decrease symptoms among children with ASD.

**Hypotheses**

- The researcher's first hypothesis is that participation in a 1 hour per week, 8-week THR program will decrease irritability in children with ASD.
- The researcher's second hypothesis is that participation in a 1 hour per week, 8-week THR program will decrease lethargy/social withdrawal in children with ASD.
- The researcher's third hypothesis is that participation in a 1 hour per week, 8-week THR program will decrease stereotypy in children with ASD.
- The researcher's fourth hypothesis is that participation in a 1 hour per week, 8-week THR program will decrease hyperactivity/non-compliance in children with ASD.
- The researcher's fifth hypothesis is that participation in a 1 hour per week, 8-week THR program will decrease inappropriate speech in children with ASD.

**Null Hypotheses**

- THR will have no effect on irritability in children with ASD.
- THR will have no effect on lethargy/social withdrawal in children with ASD.
- THR will have no effect on stereotypy in children with ASD.
- THR will have no effect on hyperactivity/non-compliance in children with ASD.
- THR will have no effect on inappropriate speech in children with ASD.

**Assumptions**

- The same instructor would lead each class for the 8-week program.
- Every participant would attend and participate in all sessions.

**Limitations**

- Small sample size
- Shorter time period
- Lacking a control group

- Single source assessment ratings

**Summary**

THR may be a beneficial intervention to utilize when treating children with ASD for symptoms leading to problematic behaviors among many other functional improvements (Gabriels et al., 2011). The horses used in the intervention may provide the child with an opportunity to learn appropriate social skills by acting as a transitional object (Boyd & Roux, 2017). The transference aids in emotional connections and may increase their interest in interacting with others (Boyd & Roux, 2017; Ward, Whalon, Rusnak, Wendell, & Paschall, 2013). Improvement of symptoms will improve the quality of life for the child but also the parents/caregivers (Hong, Kim, Lee, & Choi, 2018). The purpose of this study was to determine if an 8-week THR program would decrease symptoms among children with ASD.

**Definitions**

- Autism Spectrum Disorder – neurodevelopmental disorder on a continuum of symptoms and recognized by deficits in communication, socialization, and repetitive, stereotypical behaviors (Gabriels et al., 2011; Ghorban, Sedigheh, Marzieh, & Yaghoob, 2013; Ward, Whalon, Rusnak, Wendell, & Paschall, 2013).
- Therapeutic Horseback Riding – directed by a well-trained individual with a Professional Association of Therapeutic Horsemanship (PATH) certification. THR places an emphasis on basic care and grooming of the horse, in addition to riding skills and activities for the rider (Borgi, 2016).
- Irritability – mild to severe outward displays of disordered behaviors potentially resulting in violent actions (Snaith & Taylor, 2018).
- Lethargy – lacking enthusiasm and energy, deep unresponsiveness (Cunningham & Schreibman, 2008)

- Stereotypy – repetitive behaviors for no apparent reason (Cunningham & Schreibman, 2008).
- Hyperactivity – condition of being constantly and abnormally active which may be a disruptive behavior primarily present in children (Leitner, 2014).
- Inappropriate Speech – speaking in a way that is not suitable for the situation. Responses may be unrelated, hard to comprehend or echoing what was previously stated (Snaith & Taylor, 2018).

# CHAPTER II

## REVIEW OF LITERATURE

### Developmental Disabilities

Developmental disability as defined by Johnson (2009) is, "a severe, chronic disability that is attributable to a physical or mental impairment that is likely to continue throughout the person's life and results in functional limitation in three or more areas of life activities (p. 159)." A developmental disability may surface at any stage in the developmental process of a growing child. If the symptoms are severe enough, a diagnosis may be reached before 12 months of age (American Psychiatric Association, 2013). Many begin during pregnancy due to genetics or the health and habits of the parent, difficulties during the birthing process, infections, and/or environmental toxins (Boyle et al., 2011). The cause of developmental disorders is not always easily determined. Common types of developmental disabilities are: Attention Deficit Hyperactivity Disorder (ADHD), Intellectual Disability (ID), Autism Spectrum Disorder (ASD), numerous learning disabilities, seizures, vision impairments, hearing loss, and various other developmental delays (Boyle et al., 2011; Johnson, 2009). Common symptoms may include but are not limited to: Falling behind other children their age in fine and gross motor functioning, language, social or thinking skills, sleep difficulties, short attention spans, increased aggression, difficulty self-soothing, reading nonverbal cues and expressing feelings,

sensitivity to noises, and sustained infant-like behaviors (Johnson, 2009).

**Autism Spectrum Disorder**

It is well known that ASD is highly hereditary, the exact cause of the disorder is still being researched (Gabriels et al., 2011). ASD is a neurodevelopmental disorder that typically appears before the age of 3 but in higher functioning individuals my go undetected until later in life (Ghorban,Sedigheh, Marzieh, & Yagoob, 2013). It is a continuum of developmental disorders recognized by deficits in communication, socialization, and repetitive, stereotypical behaviors (Gabriels et al., 2011; Ward, Whalon, Rusnak, Wendell, & Paschall, 2013). Children with ASD express a distinct lack of social awareness and communication, the inability to maintain direct attention, mood complications, intolerance of change, and substantial deficits in sensory integration (Bass, Duchowny, & Llabre, 2009; Harfterkamp, Buitelaar, Minderaa, van de Loo-Neus, van der Gaag, & Hoekstra, 2014). Manifestations vary significantly depending on "the severity of the autistic condition, developmental level, and chronological age; hence the term *spectrum* (American Psychiatric Association, 2013, p. 53)." Every case within the disorder is different from the next and range from high-functioning, where deficits are difficult to detect to low-functioning, with flat affect and limited interaction. Deficits in verbal and non-verbal communication may include: a reduced, unusual, or complete lack of verbalization, eye contact, facial expressions, and gestures, poor language comprehension, echoed dialogue, or excessively literal language. It can be difficult for an individual with ASD to not only understand the meaning and tone of words being spoken to them but also the non-verbal cues like body language and facial expression that are crucial to gaining a full comprehension of the conversation. A lack of social-emotional reciprocity is evident in young children with ASD because they do not interact well or at all with other children, show emotion, or imitate behaviors. Children learn from watching other people interact and behave. When they are cognitively unable to comprehend the

behaviors of those around them, they are unable to develop appropriate interaction skills (Harris & Williams, 2017).

Frustration and confusion are often overwhelming, which could lead to aggressive outbursts and the potential to harm by the individual with ASD to their self or others. Individuals with ASD often demonstrate repetitive behaviors such as motor stereotypy patterns (e.g. rocking or hand flapping), use of objects (e.g. spinning or lining up toys), and speech (e.g. repeating familiar words or phrases) (American Psychiatric Association, 2013). Restrictive behaviors prevent them from being able to adapt in a changing environment. Meaning, once a certain behavior or routine has been established it is difficult to change and may cause great distress. Also, children with ASD often lack imagination and the ability to participate in free play. Strict and organized schedules or routines in familiar environments provide a comfort zone for them due to the related heightened awareness of the sensory stimuli and surroundings. Individuals with ASD often prefer neutral, peaceful, and predictable environments (Harris & Williams, 2017). Those with ASD may also express behavior patterns, fascinations with objects, and the reactions may be associated with hypo- or hyperreactivity to sensory stimuli. Other common features of ASD include sensitivity or insensitivity to light, sound, texture, smells, moving objects, taste, pain, and temperature (American Psychiatric Association, 2013). Stimuli may be appealing to one individual and overwhelming to the next. When a source of interest is found, it is often the key to motivating the individual to participate in interventions (Harris & Williams, 2017).

According to the American Psychiatric Association (2013), the severity of symptoms is categorized into three levels: Requiring support (level one), requiring substantial support (level two), and requiring very substantial support (level three). Table 1 shows the defining characteristic deficits of each level. Because of these deficits associated with all three levels, children often develop difficulties forming and sustaining relationships with others and often leads to social isolation (Harris & Williams, 2017).

Table 1

*ASD Severity*

| | Level 1 | Level 2 | Level 3 |
|---|---|---|---|
| Support | Verbal but struggles without support | Deficits in verbal/nonverbal communication even with support is present | Relies on support – may be completely nonverbal |
| Social Communication | Noticeable impairments | May only speak when strongly interested | Commonly unresponsive when spoken to |
| Appropriate Communication | May not speak in full sentences and/or provide responses that fit the context of conversation | Express patterns of odd nonverbal communication | Highly unlikely initiation of any type of social interaction occurs |
| Flexibility | Desire repetitive actions-switching between activities proves to be problematic | May experience distress switching activities and coping with changes | Experience extreme distress when having to cope with change |

*Note*: Adapted from "American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, Text Revision (DSM IV-TR);* American Psychiatric Association: Washington, DC, USA, 2000; Volume IV.

**Equine-Assisted Activities and Therapies**

Animal Assisted Activities (AAA) includes any activity that accompanied by an animal to help those with and without special needs. The intervention is not designed with a specific individual in mind and does not require goals or detailed reports of the session (Rigby & Grandjean, 2016). Animal-Assisted Therapy (AAT) is a category of therapeutic modalities that incorporate animals such as dogs, cats, birds, horses, etc. into interventions. Recreational Therapists may integrate AAT into a patient's treatment plan as long as it is expected to bring about a functional change. AAT requires the application of the recreational therapy process. The

therapist must first assess the patient's needs and then create goals and objectives incorporating the animal(s) for the improvement of their physical, cognitive, behavioral, social, and/or emotional functioning (Porter, 2016). EAAT includes two equine related therapies, Hippotherapy and Therapeutic Horseback Riding (THR). Hippotherapy professionals (often including certified Speech, Occupational, or Physical Therapists) which use the horse's movements combined with various horseback activities to improve the individual's functional abilities and overall quality of life (Rigby & Grandjean, 2016). The main focus is on the physical outcomes received by an individual from the movement of the horse in order to rehabilitate the individual. THR sessions are designed to teach individuals with various disabilities basic riding and horsemanship skills while improving the physical and psychosocial aspects of their life (Rigby & Grandjean, 2016).

**Therapeutic Horseback Riding**

A review of literature revealed a majority of EAAT is centered around Hippotherapy. This study will focus on THR which is directed by an individual with a Professional Association of Therapeutic Horsemanship (PATH) certification. Instructors must be "competent in in the basic levels of equine management, horsemanship, riding instruction, teaching methodologies, and disabilities (PATH International, 2019)" to receive the certification. Table 2 contains an explanation of the requirements within each category that is needed to achieve the certification.

Table 2

*PATH International Certification Requirements*

| Equine Management | Horsemanship | Riding Instruction | Teaching Methodologies | Disabilities |
|---|---|---|---|---|
| Must know: Different horse breeds | Must know: How to equip horses and riders safely | Must know: Techniques for properly instructing the areas covered in the previous columns | Must follow all PATH International standards | Must know: Basic human anatomy and movement terminology |
| Parts of the horse | Proper mounting and dismounting techniques | | Keep proper records and lesson plans | Contraindications for each rider participating in the program |
| Characteristics of horse behavior | Correct positioning of tack, riders, and volunteers | | Know PATH International teaching expectations, abilities, and methods | Proper bodily mechanics |
| Feeding and grooming requirements | Desire repetitive actions-switching between activities proves to be problematic | | | Benefits of THR for educating participants |
| Stable management | Various games and exercises | | | |
| Various types of tack and its purpose | | | | |
| Therapy horse selection and training | | | | |
| Illness signs, care, and prevention for the horses | | | | |

*Note*: Adapted from PATH Intl. February 6, 2019. Retrieved from https://www.pathintl.org/images/pdf/resources/certifications/2018-registered-instructor-criteria.pdf

THR places an emphasis on basic care and grooming of the horse, in addition to riding skills and activities for the rider (Borgi, 2016). In order to teach the individual riding skills and direct activities, the instructor relies on the rider's "control, attention and focus, sensory management, and communication (Ward, Whalon, Rusnak, Wendell, & Paschall, 2013, p. 2190)." The interventions produce a multisensory experience and is designed to improve various aspects of the individual's life including; fine and gross motor skills, social interactions, communication, physical and cognitive functioning, emotional and behavioral regulation (Rigby & Grandjean, 2016; Gabriels et al., 2012). THR establishes a therapeutic bond between the horse, the rider, and the side walkers to establish a safe and trusting environment to facilitate functional improvements. Therapy horses must undergo extensive training before they are entrusted with a rider. Selected horses typically have a calm temperament and slow, predictable movements that provide a peaceful, anxiety-reducing experience for a rider who may already be exceeding the parameter of their comfort zone (Harris & Williams, 2017) by participating in a foreign activity. Another factor contributing to the relaxation of the rider could be the warmth from the horse's body (Gabriels et al., 2012). Horses are responsive to subtle cues and movements of the rider. Meaning, if the rider wants the horse to follow their cues, the rider must stay in control and aware of their bodily movements. This "cause and effect" experience allows the rider (especially those with behavioral issues) to better understand how their actions and behaviors effect those around them (Harris & Williams, 2017).

THR professionals strongly encourage participates to use verbal commands in addition to physical cues when directing the horse. The horse is trained not to move until the rider (or assistance from a sidewalker) says, "Walk on." In order to get the horse to back up, the rider says, "Back", and lightly pulls the reins backwards. These and other specific verbal commands and physical cues direct the horse in completing the rider's desired movements. This cause-and-effect variable often appeals to those with ASD because of their concrete learning style (Gabriels et al.,

2012; Ward, Whalon, Rusnak, Wendell, & Paschall, 2013). The rider may begin to make the connection between their verbal and non-verbal communication (verbal commands and physical cues) and the influence it has on the behavior of the horse (Ward, Whalon, Rusnak, Wendell, & Paschall, 2013). The horse responds to the rider's cues and is aware of their behaviors. When the rider is calm the horse is calm. When the rider is upset or being disruptive, the rider can see how it causes the horse to react. The horse may turn its ears and eyes back toward the participant allowing the instructor or volunteers to use the horse's reactions as a teaching point. The command or cue given by the rider and immediate response from the horse, along with practicing the verbal commands may be components leading to the improvement of their expressive language and communication skills (Gabriels et al., 2012; Ghorban, Sedigheh, Marzieh, & Yaghoob, 2013). When children with ASD are better able to communicate their needs to those around them, they are less likely to act out because their needs aren't being meet (Gabriels et al., 2012).

When interacting with a horse, it is not as socially complex or cognitively demanding as interacting with humans because the horse is unable to verbally respond (Harris & Williams, 2017). The participant may feel less threatened because of the one-way conversation (Boyd & Roux, 2017) that is free of negative interactions and judgment from peers. Therapy horses respond when cued and treat all participants equally. The client gains a sense of control and independence due to their capabilities and authority used to guide the horse. Horses may also act as a transitional object. A bond formed between the rider and horse is sometimes transferred to another human. The transference aids in emotional connection with others (Boyd & Roux, 2017). The horse provides a safe environment making it easier for the rider to trust and gain confidence. The confidence developed could allow the rider to better convey their emotions and improve their vocalization. When a rider feels more comfortable and receives positive feedback for their positive emotional expressions, they are more likely to continue the behavior (Boyd & Roux,

2017). The participants may acquire a greater sense of self-confidence, interest in interacting with others, and better focus on the task at hand through THR participation (Ward, Whalon, Rusnak, Wendell, & Paschall, 2013).

According to Memari et al. (2015), children with ASD most often do not meet the national physical activity standard for children of similar age and developmental level. Interventions within THR are designed to increase physical activity and enhance physical functioning. THR provides a modality to improve gross motor function, spasticity, muscle strength and symmetry, posture, balance, stability, and gait (Rigby & Grandjean, 2016). Potential functional gross motor improvements may stem from the physical activity demand THR sessions incorporate. Balance, core stability, and lower limb strength are needed to sit on top of the horse. When a participant rides a walking horse, the movement mimics the ambulation pelvic rotation of a normally functioning human. The passive and active stretching, primarily in the hip adductors, are a highly useful outcome for those with abnormally high muscle tone while improving spasticity and muscle asymmetry (Rigby & Grandjean, 2016). Balance, posture, and core strength and stability improvements are obtained through center of gravity shifts elicited by the moving horse, reining, and reaching for various items in the environment. In addition to the neuromuscular improvements, the study by Rigby & Grandjean (2016) also found modest improvements in their cardiovascular systems. Their findings suggest that the combined benefits found from consistent participation in THR assist in making activities of daily living easier to complete. Research shows that when an individual is getting adequate physical activity, it not only improves their physical well-being but also, their mental and emotional well-being. Smedegaard, Christiansen, Lund-Cramer, Bredahl, and Skovgaard (2016), claimed that this is especially true for the younger generations. Physical activity has been shown to decrease depression, anxiety, and stress, while improving emotion regulation, sleep quality, focus, and overall mood (Rigby & Grandjean, 2016).

Children with developmental disabilities typically express behavioral and self-regulation issues when having to share attention with others (Gabriels et al., 2012; Ward, Whalon, Rusnak, Wendell, & Paschall, 2013). Even when the instructor is directing their attention toward other children, the child is still receiving attention from the horse and volunteers. It is an individualized experience with adequate attention regardless of the number of participants. Common ASD symptoms such as irritability, hyperactivity, and lethargy are often controlled with the use of pharmacological solutions (Gabriels et al., 2012). Medication was thought to be necessary for managing behavioral issues, allowing for development of social skills and the ability to learn from those interactions. Goal-oriented interactions with horses have shown enhancements in the rider's mental well-being, sense of self-efficacy, and self-esteem; all positively effecting their mood and decreasing symptoms (Borgi et al., 2016), in some cases without the aid of medication (Gabriels et al., 2012). As stated in previous sections, THR sessions allow the participant to achieve the recommended physical activity goal with the potential to decrease their stress and anxiety while improving their overall mood (Rigby & Grandjean, 2016), form a bond with the horse and possibly transfer that connection to other people (Boyd & Roux, 2017), improve their verbal and social skills expanding their ability to communicate needs (Ward, Whalon, Rusnak, Wendell, & Paschall, 2013), while understanding that their behaviors impact those around them (Gabriels et al., 2012).

Gabriels, Pan, Guerin, Dechant and Mesibov (2018) conducted a study that tested the long-term effects of a 10-week THR program had on individuals with ASD. The initial assessment was performed one month prior to the intervention and the final assessment was performed six months post-intervention. Results immediately following the intervention showed reductions in irritable behaviors and hyperactivity, and an increase in their social and communication behaviors such as the amount of words and any new words that were used. However, the decrease in hyperactive behaviors was not maintained at the 6-month post-

intervention assessment. While present at their initial assessment phase, their findings suggest that THR could be an effective modality for improving social and verbal skills during and after participating in a 10-week THR program but only reducing hyperactivity with regular attendance in THR sessions.

Another 10-week THR study conducted by Gabriels et al. (2012) looked at the outcome measures for self-regulation, adaptive living skills, and motor skills of individuals with ASD. Participants were asked to complete intervention tasks such as grooming and riding the horse, stretching, core stability interventions and social-communication activities. Self-regulation in terms of "irritability, lethargy, stereotypic behavior, hyperactivity/noncompliance, and inappropriate speech (Gabriels et al., 2012, p. 582)," showed statistically significant decreases in frequency. The participants expressed their thoughts and emotions in more constructive ways, they were more cooperative during interventions, and were more willing to try new things. Adaptive living skills, that were tested included communication, social skills, and daily living tasks, all showing statistically significant improvements. They found that participants experienced an increase in positive moods, better eye contact when conversing, and were more willing to hold conversations with those around them. One parent/legal guardian stated, "Overall, he has been more conversational. He has been sharing and compromising more and he is better with turn-taking, decreased anger, and better expressing himself (Gabriels et al., 2012, p. 586)". Lastly, motor skills also showed improvements in the areas of motor proficiency of fine motor skills, gross motor skills, and sensory processing. Riders see other participants and horses in addition to feeling the movements while on top of the horse. Riders smell various scents including but not limited to the horse, barn or stable, dirt and grass. They also feel the textures from the horse's coat, the saddle, reins and grooming tools, and the movements underneath them produced by the horse. Although the movements of the horse are slow and predictable, the rider must continuously adjust their bodies to maintain balance and their position on top of the horse. These adjustments

lead to improvements in "muscle strength, tone, bilateral control, balance, and range of motion (Gabriels et al., 2012, p. 586)." These gross motor and self-regulation improvements are all obtained while the environment is demanding multisensory stimuli processing.

There is not an established standard related to length, but many studies suggest that 10-week programs showed improved outcomes. Jenkins and DiGennaro Reed (2013) conducted a study to evaluate the effects of a 9-week THR program on behavior of children with ASD. Their results were not statistically significant but showed improvements in the experimental and control groups. They noted that their lack of statistically significant results could be an outcome of the shorter duration. They also suggested observing the behaviors over a longer period, 12-16 weeks, would provide a better opportunity to see behavior trends without potential extraneous variables intervening (Jenkins & DiGennaro Reed, 2013). In contrast, Harris and Williams (2017), conducted a 7-week program evaluating symptoms of children with ASD and found that participants with ASD not only had statistically significant improvements in their social functioning but also decreases in ASD symptoms. When evaluating hyperactivity specifically, they found improvements in as little as 5-7 weeks when compared to studies by Gabriels et al. (2015) and Gabriels et al. (2012) which were both 10-week programs. They also suggested a longer program duration could yield more extensive developments in social function in the areas of irritability, lethargy, stereotypy and inappropriate speech. Further research is needed to determine the most effective duration for THR programs to produce ideal outcomes.

**Theoretical Basis**

The Social Cognitive Theory (SCT) is one that claims people are not motivated by inner forces alone nor are they molded or influenced by external forces alone. The theory states that human behaviors are better determined by the reciprocity of a triad of behavior, cognitive and other personal factors, and environmental events (Bandura, 1986). It is based on the idea that

individuals obtain knowledge by direct experiences and symbolic terms through five primary capabilities: symbolizing capability, forethought capability, vicarious capability, self-regulatory capability, and self-reflective capability.

Symbolizing and forethought capabilities go hand and hand. Symbolizing capability allows individuals to transfer experiences into knowledge they can use for future actions. While forethought capabilities allow the individual to anticipate potential outcomes for their actions. They may envision symbolic actions instead of attempting a trial and error method for every issue that arises. By drawing from this symbolic and forethought knowledge, they may come up with innovative solutions and evaluate potential outcomes thus saving them from the loss of missteps (Bandura, 1986). During THR sessions, individuals are asked to complete various tasks requiring them to think of the best approach. When a challenge is presented, the instructor may walk the individual through the task segments and ask what they think the best approach would be. As they process the steps, they envision themselves completing the task, therefore calling on their symbolic and forethought knowledge.

Vicarious capabilities stem from observing other individual's behaviors and the consequences that follow. Virtually all learning can be obtained through the observation of others completing the task and the consequences that follow their actions. By modeling the behaviors of others, individuals may develop a higher level of cognitive development (Bandura, 1986). THR sessions are typically performed in a group setting. Participants have the opportunity to observe other participants complete intervention tasks and then give the same task a try. If the individuals observing pay attention to the steps the rider performing the task takes, they should be able to figure out what worked well and what they should avoid doing in order to successfully complete the task.

Self-Regulatory capabilities describe individuals' ability to regulate internal standards and self-evaluations (Bandura, 1986). All humans have different internal motivations typically defined by their own values and personal standards. These standards are what each individual holds themselves to (Bandura, 1986). THR programs are privilege that participants look forward to. They understand that they have to behave a certain way if they want to participate. If they are acting unruly and disruptive, they may upset the horse and the other riders. Therefore, they must regulate their actions to fit the desired behavior of the THR program.

Self-Reflective capabilities allow individuals to evaluate the thoughts and experiences. This enables them to originate information about themselves and the rest of the world (Bandura, 1986) while generating new ideas, critiquing their current thoughts, and taking actions accordingly. THR sessions often end in a debriefing where participants are asked various questions about the interventions performed. Through this they are able to analyze the actions they took, whether they were successful, and whether or not they should perform it the same way the next time.

SCT revolves around the idea that knowledge is acquired through direct observation of models surrounding them. During THR sessions, these models come in the form of the instructor, volunteers, other riders, and the horse. Live demonstrations occur by watching the instructor or other riders complete a task and behave in an appropriate manner. Indirect forms of modeling may occur through nonverbal reactions of the horse derived from the behavior of the rider. They see when they are making too much noise or moving in an erratic and unpredictable manner, they catch negative attention from the horse. Bandura (1986) argues that "human behavior is caused by personal, behavioral, and environmental influences (p.18)." Thus meaning, if an individual is participating in a THR session and receiving positive influences from those in their environment, they may develop positive behaviors by understanding the impact their actions make on others and modeling the positive behaviors they witness.

**Aberrant Behavior Checklist-Community**

The Aberrant Behavior Checklist-Community (ABC-C) is a 58-item checklist that can be administered by a parent/caregiver, special educator, nurse, mental health professional, or anyone with extensive knowledge of the behaviors of the individual being assessed (Gabriels et al., 2012).The assessment used in this study is one with high internal consistency, established validity, and adequate reliability (Gabriels, Pan, Dechant, Agnew, Brim, & Mesibov, 2015). A study by Kaat, Lecavalier, and Aman (2014) tested the validity of the ABC-C and found that "the five subscales had acceptable to excellent internal consistency" and "evidenced good convergent and divergent validity (p. 1116)." Internal consistency is based on correlations between various items in the test and that the items produce similar results that they each propose to measure. In a study by Norris, Aman, Mazurek, Scherr, & Butter (2019, p. 5) the internal consistency for the five subscales measured as follows; Irritability = .92, Lethargy = .88, Stereotypic Behavior = .86, Hyperactivity/Noncompliance = .93, and Inappropriate Speech = .73. The study compared the ABC-C subscales with the Vineland Adaptive Behavior Scales (VABS), Social Responsiveness Scale (SRS), Repetitive Behavior Scale-Revised (RBS-R), and Ohio Autism Clinical Impairment Scale Severity (OACIS) to test the validity of the ABC-C. Convergent Validity means that the constructs that are anticipated to be related, are in fact related. While Divergent Validity is the opposite, meaning, constructs that should not be related, are not related. Good-to-excellent values were found in all subscales excluding Inappropriate Speech potentially due to young, nonverbal, and/or minimally verbal individuals would not have high endorsement rates of these items as half of the sample were preschoolers. Subscales excluding Inappropriate Speech were negatively related with all subscales associated with the VABS. The subscale of Socialization was the only one associated with Inappropriate speech (Norris, Aman, Mazurek, Scherr, & Butter (2019). Correlations between the two were .2-.3. Statistically significant correlations were also found between the ABC-C and the SRS total score suggesting a moderate relationship (.39-.63).

Correlations were as expected when comparing the ABC-C with OACIS and RBS-R subscales. The largest correlation was between the ABC-C Stereotypy subscale and RBS-R Stereotypic Behavior subscale (.73) (Norris, Aman, Mazurek, Scherr, & Butter, 2019, p. 5). The study results supported the internal consistency and validity of the ABC-C being used as an assessment tool for youth who have been diagnosed with ASD.

Another important component of determining whether an assessment will measure the desired outcome is reliability. Reliability is how consistently the assessment makes accurate measurements and consists of interrater and intrarater reliability. Interrater reliability is determined by how homogeneous the scores given by several different raters are, whereas intrarater reliability is how consistently the same rater scores ratings across multiple assessments. According to Aman and Singh (2017), when those filling out the questionnaire performed similar roles in the subject's life, the interrater reliability was approximately .60. They also looked at seven different studies of the intrarater reliability and found that 43 of the 55 correlation figures (78%) fell into the category "excellent" meaning between the ranges of .75-1.00. These findings support the use of the ABC-C in research and clinical settings when assessing children with AS The assessment is used to evaluate specific symptoms of children starting at age 5 throughout adulthood, with developmental disabilities while they are in a community setting. Each item is given a score of 0-3; 0 (never a problem), 1 (a slight problem), 2 (moderately serious problem), or 3 (severe problem) (Schmidt, Huete, Fodstad, Chin & Kurtz, 2013). The specific symptoms are divided into five subgroups: irritability, lethargy/social withdrawal, stereotypic behavior, hyperactivity/noncompliance, and inappropriate speech (Gabriels et al., 2012; Gabriels, Pan, Dechant, Agnew, Brim, & Mesibov, 2015). All subgroups are commonly found behaviors in individuals with developmental disabilities, especially ASD, that challenge the success of their day-to-day functioning and are important areas to improve for their overall well-being.

# CHAPTER III

## METHODOLOGY

The purpose of this study was to determine if an 8-week THR program would decrease symptoms among children with ASD. The researcher hypothesized that participation in a THR program session for 1 hour, once per week for 8 weeks, would decrease the severity of irritability, social withdrawal/lethargy, stereotypy, hyperactivity/noncompliance, and inappropriate speech in children with ASD.

The parent or guardian was given an informed consent form to be completed before participation in the study is granted. Parents or guardians were asked to fill out the ABC-C prior to starting the program to establish a baseline for comparison. Then, once the child completes all eight weeks, the teacher or guardian is asked to fill out the final ABC-C assessment to establish whether any benefits were obtained over the duration of the THR program. Participants were asked to ensure that their child actively and consistently participate in an 8-week program that will comprise of attending one session per week for one hour. During that hour, their child was asked to complete various interventions on and off the horse. The interventions were planned by the instructor and adapted to each rider's functional level. Riders had the same horse, instructor, and volunteers each time they attended a session to reduce variability.

### Criteria for Participation

The program chosen for this study is a THR facility that serves individuals with physical, mental, emotional, or socioeconomic challenges. Recruitment of participants began in August of

2019 at the THR facility located in a southwestern city in the U.S. The participants' children met the diagnostic criteria for ASD and fall between the ages of 5-18. Eligible parents were contacted via email and asked to be a participant in the study.

**Participants.** There were 12 individuals between the age of 5-18 in attendance at the facility that met the ASD diagnosis criteria. All 12 of the children's parents were contacted by the Facility's director. Those willing to participate in the study were included.

**Study Design**

This study used a quasi-experimental research design as it investigated THR interventions and the impact the intervention had on children with ASD. This study focused on a specific population at one facility, so convenience sampling method was used to recruit as many participants as possible. All participants were recruited based on their child's attendance at the therapeutic riding center and diagnosis of ASD rather than being randomly assigned. To ensure all participants' children received the potential benefits of participating in the THR program, values were compared between pre- and post-assessment rankings were used without use of a control group.

**Statistical Analysis.** Descriptive statistics were used to describe the association between THR and specific symptoms in the population of those with ASD, based on the sample attending the program. The mean association was calculated. Two non-parametric tests, Spearman's Rho Correlation Coefficient and Wilcoxon Signed Rank Test, were used to evaluate the correlation and association between pre and post assessment rankings of the symptoms.

Use of Spearman's Rho requires a minimum of 5 pairs of data. The value of $r_s$ when equaling 1, represents a perfect positive correlation between THR and the improvement of the symptoms. The value of $r_s$ when it equals -1, means a perfect negative correlation between THR and the worsening of symptoms. The strength of the correlation is evaluated through the value of $r_s$:

- .00-.19 (very weak)

- .20-.39 (weak)
- .40-.59 (moderate)
- .60-.79 (strong)
- .80-1.0 (very strong)

The Wilcoxon signed-rank test is used to test two related samples when the distribution cannot be assumed. Each pre-assessment sub-score was compared to the related post-assessment sub-score. This was done by using a confidence interval of 95%, which equals 1.96 for a two-tailed test. When z is 1.96 or higher, the null hypothesis is rejected.

# CHAPTER IV

# RESULTS

## Introduction

The purpose of this study was to determine if an 8-week THR program would decrease symptoms among children with ASD as reported by their parents using the ABC-C. A THR site was identified in a southwestern city in the U.S. Through the site, 12 different parents of children diagnosed with ASD were contacted and asked to participate in the study. Four parents agreed to participate in the study representing 5 individual children with ASD. This study utilized the Spearman's Rho Correlation Coefficient, a non-parametric test, to determine whether there was a correlation within the sub-scores of the pre and post assessments. Then, the Wilcoxon Signed-Rank Test was used to compare repeated measurements for the sample. The Wilcoxon was applied to each sub-scale to determine if there was a change over time. An alpha level of $p < 0.05$ was used to determine statistical significance.

## Sample Description

A total of 12 parents were contacted to participate in this study. Four parents consented to participate and completed both the pre and post assessments based off their child(ren)'s behaviors. The children had a variety of ASD severity and other associated impairments. Table 3 shows the sample's demographics. All the children have been attending the facility for at least 1.5 years. Four of the 5 children were identified by the parents as having a speech and language

impairment and 3 of the 5 as being diagnosed with an intellectual disability. One parent reported that their child was diagnosed with mild ASD and did not experience any additional impairments. This child did not see any increases or decreases in symptom severity and had been participating in the THR program for 3 years.

Table 3

*Demographics*

| Participants | Age | ASD Parent-Rated Severity (0-3) | Type of Impairment and Score (0-3) | Years of Attendance |
|---|---|---|---|---|
| 1 | 18 | 2 | Speech and Language – 2<br>Hearing – 2<br>Intellectual Disability - 2 | 1.5 Years |
| 2 | 17 | 2 | Speech and Language – 1<br>Intellectual Disability - 1 | 2 |
| 3 | 14 | 2 | Speech and Language – 2 | 3 |
| 4 | 7 | 1 | No Additional Impairments | 3 |
| 5 | 18 | 3 | Speech and Language – 3<br>Physical Disability – 2<br>Intellectual Disability - 1 | 2.5 |

Parents were asked to observe their child(ren)'s behaviors for an 8-week duration. They were asked to answer the 58 items within the ABC-C and rank each item from 0-3. The items were linked to one of the 5 sub-scales: irritability, social withdrawal/lethargy, stereotypic behaviors, hyperactivity/non-compliance, or inappropriate speech. Raw scores from the items, for each participant's pre and post-test can be found in tables 4-13.

Table 4

*Participant 1 Raw Sub-Scores from the Pre-Assessment*

| Irritability | Social Withdrawal/Lethargy | Stereotypy | Hyperactivity/ Noncompliance | Inappropriate Speech |
|---|---|---|---|---|
| 2. 0 | 3. 1 | 6. 0 | 1. 0 | 9. 0 |
| 4. 0 | 5. 3 | 11. 0 | 7. 0 | 22. 2 |
| 8. 0 | 12. 0 | 17. 0 | 13. 0 | 33. 2 |
| 10. 0 | 16. 3 | 27. 0 | 15. 1 | 46. 0 |
| 14. 1 | 20. 1 | 35. 0 | 18. 0 | |
| 19. 0 | 23. 1 | 45. 0 | 21. 0 | |
| 25. 2 | 26. 3 | 49. 0 | 24. 0 | |
| 29. 0 | 30. 3 | | 28. 1 | |
| 34. 0 | 32. 1 | | 31. 0 | |
| 36. 1 | 37. 0 | | 38. 0 | |
| 41. 0 | 40. 2 | | 39. 0 | |
| 47. 0 | 42. 3 | | 44. 2 | |
| 50. 0 | 43. 2 | | 48. 0 | |
| 52. 0 | 53. 0 | | 51. 1 | |
| 57. 0 | 55. 3 | | 54. 0 | |
| | 58. 3 | | 56. 1 | |

Table 5

*Participant 1 Raw Sub-Scores from the Post-Assessment*

| Irritability | Social Withdrawal/Lethargy | Stereotypy | Hyperactivity/ Noncompliance | Inappropriate Speech |
|---|---|---|---|---|
| 2. 0 | 3. 1 | 6. 1 | 1. 0 | 9. 2 |
| 4. 0 | 5. 3 | 11. 1 | 7. 1 | 22. 1 |
| 8. 0 | 12. 1 | 17. 2 | 13. 3 | 33. 1 |
| 10. 0 | 16. 3 | 27. 0 | 15. 1 | 46. 0 |
| 14. 0 | 20. 1 | 35. 1 | 18. 0 | |
| 19. 0 | 23. 0 | 45. 1 | 21. 0 | |
| 25. 2 | 26. 1 | 49. 1 | 24. 0 | |

| | | |
|---|---|---|
| 29. 1 | 30. 1 | 28. 1 |
| 34. 0 | 32. 1 | 31. 0 |
| 36. 0 | 37. 0 | 38. 0 |
| 41. 0 | 40. 1 | 39. 0 |
| 47. 0 | 42. 2 | 44. 0 |
| 50. 0 | 43. 1 | 48. 0 |
| 52. 0 | 53. 0 | 51. 0 |
| 57. 0 | 55. 1 | 54. 0 |
| | 58. 1 | 56. 0 |

Table 6

*Participant 2 Raw Sub-Scores from the Pre-Assessment*

| Irritability | Social Withdrawal/Lethargy | Stereotypy | Hyperactivity/ Noncompliance | Inappropriate Speech |
|---|---|---|---|---|
| 2. 0 | 3. 1 | 6. 0 | 1. 0 | 9. 0 |
| 4. 0 | 5. 3 | 11. 0 | 7. 0 | 22. 1 |
| 8. 0 | 12. 0 | 17. 1 | 13. 1 | 33. 0 |
| 10. 0 | 16. 1 | 27. 0 | 15. 1 | 46. 1 |
| 14. 1 | 20. 1 | 35. 2 | 18. 0 | |
| 19. 0 | 23. 1 | 45. 1 | 21. 0 | |
| 25. 3 | 26. 2 | 49. 1 | 24. 1 | |
| 29. 0 | 30. 1 | | 28. 0 | |
| 34. 0 | 32. 2 | | 31. 1 | |
| 36. 0 | 37. 0 | | 38. 0 | |
| 41. 0 | 40. 1 | | 39. 0 | |
| 47. 0 | 42. 3 | | 44. 0 | |
| 50. 0 | 43. 1 | | 48. 0 | |
| 52. 0 | 53. 0 | | 51. 0 | |
| 57. 0 | 55. 1 | | 54. 0 | |
| | 58. 3 | | 56. 0 | |

Table 7

*Participant 2 Raw Sub-Scores from the Post-Assessment*

| Irritability | Social Withdrawal/Lethargy | Stereotypy | Hyperactivity/ Noncompliance | Inappropriate Speech |
|---|---|---|---|---|
| 2. 0 | 3. 0 | 6. 1 | 1. 1 | 9. 0 |
| 4. 0 | 5. 1 | 11. 0 | 7. 0 | 22. 1 |
| 8. 0 | 12. 1 | 17. 0 | 13. 0 | 33. 1 |
| 10. 0 | 16. 1 | 27. 0 | 15. 2 | 46. 0 |
| 14. 1 | 20. 0 | 35. 1 | 18. 0 | |
| 19. 0 | 23. 0 | 45. 2 | 21. 0 | |
| 25. 1 | 26. 1 | 49. 1 | 24. 1 | |
| 29. 0 | 30. 1 | | 28. 2 | |
| 34. 0 | 32. 0 | | 31. 0 | |
| 36. 1 | 37. 0 | | 38. 0 | |
| 41. 0 | 40. 0 | | 39. 1 | |
| 47. 0 | 42. 1 | | 44. 2 | |
| 50. 0 | 43. 1 | | 48. 1 | |
| 52. 0 | 53. 0 | | 51. 1 | |
| 57. 0 | 55. 1 | | 54. 0 | |
| | 58. 2 | | 56. 1 | |

Table 8

*Participant 3 Raw Sub-Scores from the Pre-Assessment*

| Irritability | Social Withdrawal/Lethargy | Stereotypy | Hyperactivity/ Noncompliance | Inappropriate Speech |
|---|---|---|---|---|
| 2. 0 | 3. 1 | 6. 1 | 1. 0 | 9. 1 |
| 4. 0 | 5. 1 | 11. 0 | 7. 0 | 22. 2 |
| 8. 0 | 12. 0 | 17. 1 | 13. 1 | 33. 2 |
| 10. 1 | 16. 1 | 27. 0 | 15. 1 | 46. 2 |
| 14. 1 | 20. 1 | 35. 0 | 18. 0 | |
| 19. 0 | 23. 1 | 45. 0 | 21. 1 | |
| 25. 0 | 26. 0 | 49. 0 | 24. 1 | |

| | | | |
|---|---|---|---|
| 29. 0 | 30. 1 | | 28. 2 |
| 34. 0 | 32. 0 | | 31. 1 |
| 36. 0 | 37. 1 | | 38. 2 |
| 41. 0 | 40. 0 | | 39. 0 |
| 47. 1 | 42. 1 | | 44. 1 |
| 50. 0 | 43. 0 | | 48. 0 |
| 52. 0 | 53. 0 | | 51. 1 |
| 57. 0 | 55. 0 | | 54. 0 |
| | 58. 1 | | 56. 1 |

Table 9

*Participant 3 Raw Sub-Scores from the Post-Assessment*

| Irritability | Social Withdrawal/Lethargy | Stereotypy | Hyperactivity/ Noncompliance | Inappropriate Speech |
|---|---|---|---|---|
| 2. 0 | 3. 1 | 6. 1 | 1. 0 | 9. 1 |
| 4. 0 | 5. 1 | 11. 0 | 7. 0 | 22. 2 |
| 8. 0 | 12. 0 | 17. 0 | 13. 0 | 33. 2 |
| 10. 1 | 16. 1 | 27. 0 | 15. 0 | 46. 2 |
| 14. 0 | 20. 1 | 35. 0 | 18. 0 | |
| 19. 0 | 23. 0 | 45. 0 | 21. 1 | |
| 25. 0 | 26. 0 | 49. 0 | 24. 1 | |
| 29. 0 | 30. 1 | | 28. 2 | |
| 34. 0 | 32. 0 | | 31. 1 | |
| 36. 0 | 37. 0 | | 38. 1 | |
| 41. 0 | 40. 0 | | 39. 0 | |
| 47. 1 | 42. 1 | | 44. 1 | |
| 50. 0 | 43. 0 | | 48. 0 | |
| 52. 0 | 53. 0 | | 51. 1 | |
| 57. 1 | 55. 0 | | 54. 0 | |
| | 58. 1 | | 56. 1 | |

Table 10

*Participant 4 Raw Sub-Scores from the Pre-Assessment*

| Irritability | Social Withdrawal/Lethargy | Stereotypy | Hyperactivity/ Noncompliance | Inappropriate Speech |
|---|---|---|---|---|
| 2. 0 | 3. 0 | 6. 0 | 1. 1 | 9. 1 |
| 4. 1 | 5. 0 | 11. 0 | 7. 1 | 22. 0 |
| 8. 0 | 12. 0 | 17. 0 | 13. 1 | 33. 0 |
| 10. 0 | 16. 0 | 27. 0 | 15. 1 | 46. 0 |
| 14. 1 | 20. 0 | 35. 0 | 18. 0 | |
| 19. 0 | 23. 0 | 45. 0 | 21. 0 | |
| 25. 0 | 26. 0 | 49. 0 | 24. 0 | |
| 29. 0 | 30. 0 | | 28. 1 | |
| 34. 0 | 32. 0 | | 31. 0 | |
| 36. 1 | 37. 0 | | 38. 1 | |
| 41. 0 | 40. 0 | | 39. 0 | |
| 47. 0 | 42. 0 | | 44. 0 | |
| 50. 0 | 43. 0 | | 48. 1 | |
| 52. 0 | 53. 0 | | 51. 0 | |
| 57. 1 | 55. 0 | | 54. 1 | |
| | 58. 0 | | 56. 0 | |

Table 11

*Participant 4 Raw Sub-Scores from the Post-Assessment*

| Irritability | Social Withdrawal/Lethargy | Stereotypy | Hyperactivity/ Noncompliance | Inappropriate Speech |
|---|---|---|---|---|
| 2. 0 | 3. 0 | 6. 0 | 1. 1 | 9. 1 |
| 4. 1 | 5. 0 | 11. 0 | 7. 1 | 22. 0 |
| 8. 0 | 12. 0 | 17. 0 | 13. 1 | 33. 0 |
| 10. 0 | 16. 0 | 27. 0 | 15. 1 | 46. 0 |
| 14. 1 | 20. 0 | 35. 0 | 18. 0 | |

| | | | |
|---|---|---|---|
| 19. 0 | 23. 0 | 45. 0 | 21. 0 |
| 25. 0 | 26. 0 | 49. 0 | 24. 0 |
| 29. 0 | 30. 0 | | 28. 1 |
| 34. 0 | 32. 0 | | 31. 0 |
| 36. 1 | 37. 0 | | 38. 1 |
| 41. 0 | 40. 0 | | 39. 0 |
| 47. 0 | 42. 0 | | 44. 0 |
| 50. 0 | 43. 0 | | 48. 1 |
| 52. 0 | 53. 0 | | 51. 0 |
| 57. 1 | 55. 0 | | 54. 1 |
| | 58. 0 | | 56. 0 |

Table 12

*Participant 5 Raw Sub-Scores from the Pre-Assessment*

| Irritability | Social Withdrawal/Lethargy | Stereotypy | Hyperactivity/ Noncompliance | Inappropriate Speech |
|---|---|---|---|---|
| 2. 2 | 3. 1 | 6. 0 | 1. 0 | 9. 0 |
| 4. 1 | 5. 0 | 11. 2 | 7. 0 | 22. 0 |
| 8. 2 | 12. 0 | 17. 1 | 13. 0 | 33. 0 |
| 10. 1 | 16. 0 | 27. 0 | 15. 1 | 46. 0 |
| 14. 2 | 20. 1 | 35. 2 | 18. 2 | |
| 19. 2 | 23. 2 | 45. 0 | 21. 0 | |
| 25. 0 | 26. 1 | 49. 0 | 24. 2 | |
| 29. 1 | 30. 1 | | 28. 2 | |
| 34. 0 | 32. 0 | | 31. 2 | |
| 36. 3 | 37. 2 | | 38. 1 | |
| 41. 2 | 40. 2 | | 39. 1 | |
| 47. 1 | 42. 0 | | 44. 0 | |
| 50. 0 | 43. 0 | | 48. 0 | |
| 52. 1 | 53. 0 | | 51. 1 | |
| 57. 1 | 55. 0 | | 54. 0 | |
| | 58. 2 | | 56. 1 | |

Table 13

*Participant 5 Raw Sub-Scores from the Post-Assessment*

| Irritability | Social Withdrawal/Lethargy | Stereotypy | Hyperactivity/ Noncompliance | Inappropriate Speech |
|---|---|---|---|---|
| 2. 0 | 3. 1 | 6. 0 | 1. 0 | 9. 0 |
| 4. 0 | 5. 0 | 11. 2 | 7. 0 | 22. 0 |
| 8. 2 | 12. 0 | 17. 1 | 13. 0 | 33. 0 |
| 10. 2 | 16. 0 | 27. 0 | 15. 1 | 46. 0 |
| 14. 0 | 20. 1 | 35. 2 | 18. 0 | |
| 19. 1 | 23. 2 | 45. 0 | 21. 0 | |
| 25. 0 | 26. 1 | 49. 0 | 24. 2 | |
| 29. 1 | 30. 1 | | 28. 2 | |
| 34. 0 | 32. 0 | | 31. 2 | |
| 36. 3 | 37. 2 | | 38. 1 | |
| 41. 2 | 40. 2 | | 39. 1 | |
| 47. 1 | 42. 0 | | 44. 0 | |
| 50. 1 | 43. 0 | | 48. 0 | |
| 52. 1 | 53. 0 | | 51. 1 | |
| 57. 1 | 55. 0 | | 54. 0 | |
| | 58. 2 | | 56. 1 | |

Items relating to the distinct symptoms were pre-assigned by the ABC-C to each sub-scale. For example, the raw score from item 49 (Rocks body back and forth repeatedly) was added to the sub-scale of stereotypy. The raw score (0-3) from each item were added and the total for each item was used to assess any changes in the sub-scales related to their behaviors from pre- and post-assessment scores. Refer to table 14 to observe the sub-scores for the participants' pre-assessments. The same process of calculating the raw scores and adding each sub-scale score was done after the eighth week to represent the post-assessment scores. Refer to table 15 for the sub-scores from each participant's post-assessment.

Table 14

*Pre-Assessment Sub-Scores Totaled*

| Participants | Irritability | Social Withdrawal/Lethargy | Stereotypy | Hyperactivity/ Noncompliance | Inappropriate Speech |
|---|---|---|---|---|---|
| 1 | 4 | 29 | 0 | 6 | 4 |
| 2 | 4 | 21 | 5 | 4 | 2 |
| 3 | 3 | 9 | 2 | 12 | 7 |
| 4 | 4 | 0 | 0 | 8 | 1 |
| 5 | 19 | 12 | 5 | 13 | 0 |

Table 15

*Post-Assessment Sub-Scores Totaled*

| Participants | Irritability | Social Withdrawal/Lethargy | Stereotypy | Hyperactivity/ Noncompliance | Inappropriate Speech |
|---|---|---|---|---|---|
| 1 | 3 | 18 | 7 | 6 | 4 |
| 2 | 3 | 10 | 5 | 12 | 2 |
| 3 | 3 | 7 | 1 | 9 | 7 |
| 4 | 4 | 0 | 0 | 8 | 1 |
| 5 | 15 | 12 | 5 | 11 | 0 |

The descriptive statistics for the sample's responses to each sub-scale are provided in Table 16. Categories are grouped by each sub-scale and pre/post-assessments. Social withdrawal/lethargy saw a significant decrease in mean scores, irritability saw a slight decrease, stereotypy saw a substantial increase in mean scores, where hyperactivity/noncompliance saw a slight increase, and inappropriate speech remained the same. Without knowing the outcomes of

the statistical tests, there is already a potential for change in the sub-scales of social withdrawal/lethargy and stereotypy. The standard deviation, also found in table 16, shows the variation of responses for each sub-score. Where a standard deviation of 2.42 for social withdrawal/lethargy (pre) would be a larger deviation from the mean score of 4.36 than a standard deviation of 1.29 for inappropriate speech (pre) from the mean score of 3.5. The two sub-scales showing a decrease in mean severity scores between pre- and post-assessments (irritability and social withdrawal/lethargy) and were also the sub-scores with the largest standard deviations. Meaning, the two sub-scales had a wider range of symptom severity scores offering a higher potential for change. After completing the 8-week program, those same sub-scale scores were totaled and used to run two non-parametric tests, Spearman's Rho Correlation and Wilcoxon Signed-Rank Test, to examine the correlation within sub-scales and changes between the pre- and post-assessment rankings.

Table 16

*Descriptive Statistics for Pre-Assessment Sub-Scores*

**Descriptive Statistics**

| | N | Mean | Std. Deviation |
|---|---|---|---|
| Irritability | 15 | 2.2667 | 1.75119 |
| SocialWithdrawalLethargy | 16 | 4.3750 | 2.41868 |
| Stereotypy | 7 | 1.7143 | 1.38013 |
| HyperactivityNoncompliance | 16 | 2.8125 | 1.60078 |
| InappropriateSpeech | 4 | 3.5000 | 1.29099 |
| Valid N (listwise) | 4 | | |

Table 17

*Descriptive Statistics for Post-Assessment Sub-Scores*

**Descriptive Statistics**

| | N | Mean | Std. Deviation |
|---|---|---|---|
| IrritabilityPost | 15 | 1.6000 | .91026 |
| SocialWithdrawalLethargyPost | 16 | 2.8750 | 1.62788 |
| StereotypyPost | 7 | 2.5714 | 1.27242 |
| HyperactivityNoncompliancePost | 16 | 2.8750 | 1.85742 |
| InappropriateSpeechPost | 4 | 3.5000 | 1.00000 |
| Valid N (listwise) | 4 | | |

**Spearman's Rho Correlation Coefficient**

The Spearman Rho Correlation coefficient was used to determine whether there was a statistical relationship within the sub-scores. When comparing the sub-scales from the sample's pre-assessments, the results yielded one very strong, positive correlation ($r_s = 0.949$) at a statistical significance of 0.026 between social withdrawal/lethargy and inappropriate speech. This means there is statistically significant evidence that as social withdrawal/lethargy increases so does inappropriate speech, or as inappropriate speech decreases so does social withdrawal/lethargy, and vice versa. When comparing the sub scales from the post-assessments, it showed a very strong, negative correlation ($r_s = -0.873$) between hyperactivity and stereotypy with a statistical significance of 0.005. This means that as hyperactivity severity increases, stereotypy severity decreases or as stereotypy severity increases, hyperactivity severity decreases. Another finding from within the same test showed a perfect, positive correlation ($r_s = 1.000$) between stereotypy and inappropriate speech; meaning as stereotypy increases, so does inappropriate speech, or as inappropriate speech decreases so will stereotypic behaviors. Table 18 and 19 show correlations within the pre- and post-assessments respectfully.

Table 18

*Spearman's Rho Correlations for Pre-Assessment Sub-Scores*

**Correlations**

| | | | Irritability | SocialWithdrawalLethargy | Stereotypy | HyperactivityNoncompliance | Inappropriate Speech |
|---|---|---|---|---|---|---|---|
| Spearman's rho | Irritability | Correlation Coefficient | 1.000 | .244 | .416 | -.012 | . |
| | | Sig. (1-tailed) | . | .190 | .177 | .483 | . |
| | | N | 15 | 15 | 7 | 15 | 4 |
| | SocialWithdrawalLethargy | Correlation Coefficient | .244 | 1.000 | -.377 | .125 | .949* |
| | | Sig. (1-tailed) | .190 | . | .202 | .322 | .026 |
| | | N | 15 | 16 | 7 | 16 | 4 |
| | Stereotypy | Correlation Coefficient | .416 | -.377 | 1.000 | -.269 | -.211 |
| | | Sig. (1-tailed) | .177 | .202 | . | .280 | .395 |
| | | N | 7 | 7 | 7 | 7 | 4 |
| | HyperactivityNoncompliance | Correlation Coefficient | -.012 | .125 | -.269 | 1.000 | -.056 |
| | | Sig. (1-tailed) | .483 | .322 | .280 | . | .472 |
| | | N | 15 | 16 | 7 | 16 | 4 |
| | InappropriateSpeech | Correlation Coefficient | . | .949* | -.211 | -.056 | 1.000 |
| | | Sig. (1-tailed) | . | .026 | .395 | .472 | . |
| | | N | 4 | 4 | 4 | 4 | 4 |

*. Correlation is significant at the 0.05 level (1-tailed).

Table 19

*Spearman's Rho Correlations for Post-Assessment Sub-Scores*

**Correlations**

| | | | IrritabilityPost | SocialWithdrawalLethargyPost | StereotypyPost | HyperactivityNoncompliancePost | Inappropriate SpeechPost |
|---|---|---|---|---|---|---|---|
| Spearman's rho | IrritabilityPost | Correlation Coefficient | 1.000 | .247 | -.557 | .290 | -.775 |
| | | Sig. (1-tailed) | . | .187 | .097 | .147 | .113 |
| | | N | 15 | 15 | 7 | 15 | 4 |
| | SocialWithdrawalLethargyPost | Correlation Coefficient | .247 | 1.000 | -.365 | .211 | -.544 |
| | | Sig. (1-tailed) | .187 | . | .210 | .216 | .228 |
| | | N | 15 | 16 | 7 | 16 | 4 |
| | StereotypyPost | Correlation Coefficient | -.557 | -.365 | 1.000 | -.873** | 1.000** |
| | | Sig. (1-tailed) | .097 | .210 | . | .005 | . |
| | | N | 7 | 7 | 7 | 7 | 4 |
| | HyperactivityNoncompliancePost | Correlation Coefficient | .290 | .211 | -.873** | 1.000 | -.816 |
| | | Sig. (1-tailed) | .147 | .216 | .005 | . | .092 |
| | | N | 15 | 16 | 7 | 16 | 4 |
| | InappropriateSpeechPost | Correlation Coefficient | -.775 | -.544 | 1.000** | -.816 | 1.000 |
| | | Sig. (1-tailed) | .113 | .228 | . | .092 | . |
| | | N | 4 | 4 | 4 | 4 | 4 |

**. Correlation is significant at the 0.01 level (1-tailed).

**Wilcoxon Signed-Rank Test**

The second non-parametric test, Wilcoxon Signed-Rank test, was used to evaluate the difference between each sub-scale over time. Irritability and social withdrawal/lethargy, as shown in tables 20 and 21, were the only sub-scales showing a decrease in more items from the pre-assessment ranking. In table 20, 5 out of 15 irritability items saw a decrease, 4 saw an increase, and 6 remained the same. The sum of the negative ranks (irritability>irritability post) was 31 and the sum of positive ranks (irritability<irritability post) was 14. Even though there was only a one rank difference, the 5 out of 15 negative ranks sum was 17 ranks higher than the 4 out of 15 positive ranks. Though results were not statistically significant for irritability (0.298), we do see a slight decrease symptom severity. Referring to table 21, 13 out of 16 social withdrawal/lethargy items saw a decrease, 1 saw an increase, and 2 remained the same. The sub-scale's sum of ranks showed a dramatic difference, 97.5 for negative ranks and 7.5 for positive ranks. Social withdrawal/lethargy was the only sub-scale yielding statistically significant (0.004) results, meaning THR did cause a reduction in social withdrawal and lethargy symptoms for the children participating in the program.

Table 20

*Wilcoxon – Irritability*

**Ranks**

| | | N | Mean Rank | Sum of Ranks |
|---|---|---|---|---|
| IrritabilityPost - Irritability | Negative Ranks | 5[a] | 6.20 | 31.00 |
| | Positive Ranks | 4[b] | 3.50 | 14.00 |
| | Ties | 6[c] | | |
| | Total | 15 | | |

a. IrritabilityPost < Irritability

b. IrritabilityPost > Irritability

c. IrritabilityPost = Irritability

**Test Statistics[a]**

| | IrritabilityPost - Irritability |
|---|---|
| Z | -1.040[b] |
| Asymp. Sig. (2-tailed) | .298 |

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Table 21

*Wilcoxon – Social Withdrawal/Lethargy*

**Ranks**

| | | N | Mean Rank | Sum of Ranks |
|---|---|---|---|---|
| SocialWithdrawalLethargyPost - SocialWithdrawalLethargy | Negative Ranks | 13[a] | 7.50 | 97.50 |
| | Positive Ranks | 1[b] | 7.50 | 7.50 |
| | Ties | 2[c] | | |
| | Total | 16 | | |

a. SocialWithdrawalLethargyPost < SocialWithdrawalLethargy

b. SocialWithdrawalLethargyPost > SocialWithdrawalLethargy

c. SocialWithdrawalLethargyPost = SocialWithdrawalLethargy

**Test Statistics[a]**

| | SocialWithdrawalLethargyPost - SocialWithdrawalLethargy |
|---|---|
| Z | -2.864[b] |
| Asymp. Sig. (2-tailed) | .004 |

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Referring to table 22, the results of pre and post assessment stereotypy comparison results are displayed. Instead of finding a decrease in symptom severity, there was a reported increase. Four positive ranks, meaning post-assessment rankings were higher than pre-assessment rankings, were found along with 3 ties. Stereotypic Behavior was the only sub-scale that did not have any negative ranks. Meaning, none of the severity scores for Stereotypic Behaviors were reported to be lower after the completion of the 8-week program. Table 23 also shows a slight increase in

severity regarding the sub-scale, hyperactivity/noncompliance. Four out of the 16 items showed a decrease, 6 showed an increase, and 6 remained the same. Due to the fact that 10 out of 15 hyperactivity/noncompliance items decreased or remained the same, the significance is much higher (.627) than the significance for stereotypy (.062) when considering 7 out of 7 items in Table 22 decreased or stayed the same.

Table 22

*Wilcoxon – Stereotypic Behaviors*

**Ranks**

| | | N | Mean Rank | Sum of Ranks |
|---|---|---|---|---|
| StereotypyPost - Stereotypy | Negative Ranks | 0[a] | .00 | .00 |
| | Positive Ranks | 4[b] | 2.50 | 10.00 |
| | Ties | 3[c] | | |
| | Total | 7 | | |

a. StereotypyPost < Stereotypy

b. StereotypyPost > Stereotypy

c. StereotypyPost = Stereotypy

**Test Statistics[a]**

| | StereotypyPost - Stereotypy |
|---|---|
| Z | -1.857[b] |
| Asymp. Sig. (2-tailed) | .063 |

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Table 23

*Wilcoxon – Hyperactivity/Noncompliance*

**Ranks**

| | | N | Mean Rank | Sum of Ranks |
|---|---|---|---|---|
| HyperactivityNoncompliancePost - HyperactivityNoncompliance | Negative Ranks | 4[a] | 5.75 | 23.00 |
| | Positive Ranks | 6[b] | 5.33 | 32.00 |
| | Ties | 6[c] | | |
| | Total | 16 | | |

a. HyperactivityNoncompliancePost < HyperactivityNoncompliance

b. HyperactivityNoncompliancePost > HyperactivityNoncompliance

c. HyperactivityNoncompliancePost = HyperactivityNoncompliance

**Test Statistics[a]**

| | HyperactivityNoncompliancePost - HyperactivityNoncompliance |
|---|---|
| Z | -.486[b] |
| Asymp. Sig. (2-tailed) | .627 |

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Referring to Table 24, there are 2 items showing an increase and 2 showing a decrease. Although there was a spilt, the mean for items showing an increase was higher than the mean of items showing a decrease which lead to an increase in total rank by 4. With a significance value of 0.458, we are unable to conclude that there was a statistically significant change in inappropriate speech symptom severity.

Table 24

*Wilcoxon – Inappropriate Speech*

**Ranks**

| | | N | Mean Rank | Sum of Ranks |
|---|---|---|---|---|
| InappropriateSpeechPost - InappropriateSpeech | Negative Ranks | 2[a] | 1.50 | 3.00 |
| | Positive Ranks | 2[b] | 3.50 | 7.00 |
| | Ties | 0[c] | | |
| | Total | 4 | | |

a. InappropriateSpeechPost < InappropriateSpeech

b. InappropriateSpeechPost > InappropriateSpeech

c. InappropriateSpeechPost = InappropriateSpeech

**Test Statistics[a]**

| | Inappropriate SpeechPost - Inappropriate Speech |
|---|---|
| Z | -.743[b] |
| Asymp. Sig. (2-tailed) | .458 |

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

**Summary**

Four participants using the ABC-C to rate 5 children's behaviors prior to and after completing an 8-week THR program was used to determine whether THR caused a decrease in ASD symptom severity. The Spearman's Rho Correlation coefficient was used to evaluate whether there was a correlation within the sub-scales: irritability, social withdrawal/lethargy, stereotypy, hyperactivity/noncompliance, and inappropriate speech. Three statistically significant correlations were found. Within the pre-assessment one very strong, positive correlation was found between social withdrawal/lethargy and inappropriate speech. Two correlations were found within the post-assessment test. One very strong, negative correlation between stereotypy and hyperactivity and one perfect, positive correlation between stereotypy and inappropriate speech.

According to the Wilcoxon test statistics found in tables 25-29, only one of the sub-scales generated statistically significant results (social withdrawal/lethargy) produced by THR causing a decrease in ASD symptoms. Therefore, we fail to reject the other four hypotheses. THR did not statistically influence severity levels of irritability, stereotypic behavior, hyperactivity/noncompliance, or inappropriate speech as reported by the participants. Though, there was a trend for increase in stereotypy after the final week of the program.

Table 25

*Hypothesis Test Summary for Irritability*

**Hypothesis Test Summary**

| | Null Hypothesis | Test | Sig. | Decision |
|---|---|---|---|---|
| 1 | The median of differences between Irritability and IrritabilityPost equals 0. | Related-Samples Wilcoxon Signed Rank Test | .298 | Retain the null hypothesis. |

Asymptotic significances are displayed. The significance level is .05.

Table 26

*Hypothesis Test Summary for Social Withdrawal/Lethargy*

**Hypothesis Test Summary**

| | Null Hypothesis | Test | Sig. | Decision |
|---|---|---|---|---|
| 1 | The median of differences between SocialWithdrawalLethargy and SocialWithdrawalLethargyPost equals 0. | Related-Samples Wilcoxon Signed Rank Test | .004 | Reject the null hypothesis. |

Asymptotic significances are displayed. The significance level is .05.

Table 27

*Hypothesis Test Summary for Stereotypy*

**Hypothesis Test Summary**

| | Null Hypothesis | Test | Sig. | Decision |
|---|---|---|---|---|
| 1 | The median of differences between Stereotypy and StereotypyPost equals 0. | Related-Samples Wilcoxon Signed Rank Test | .063 | Retain the null hypothesis. |

Asymptotic significances are displayed. The significance level is .05.

Table 28

*Hypothesis Test Summary for Hyperactivity/Noncompliance*

**Hypothesis Test Summary**

| | Null Hypothesis | Test | Sig. | Decision |
|---|---|---|---|---|
| 1 | The median of differences between HyperactivityNoncompliance and HyperactivityNoncompliancePost equals 0. | Related-Samples Wilcoxon Signed Rank Test | .627 | Retain the null hypothesis. |

Asymptotic significances are displayed. The significance level is .05.

Table 29

*Hypothesis Test Summary for Inappropriate Speech*

**Hypothesis Test Summary**

| | Null Hypothesis | Test | Sig. | Decision |
|---|---|---|---|---|
| 1 | The median of differences between InappropriateSpeech and InappropriateSpeechPost equals 0. | Related-Samples Wilcoxon Signed Rank Test | .458 | Retain the null hypothesis. |

Asymptotic significances are displayed. The significance level is .05.

# CHAPTER V

## DISCUSSION

Due to the growing rate of children with ASD, this study was designed to examine the effects of THR on ASD symptom severity and determine whether it was an effective intervention for five common ASD symptoms. Previous studies reported statistically significant improvements in functional areas such as fine and gross motor skills, social interactions, communication, physical and cognitive functioning, emotional and behavioral regulation (Rigby & Grandjean, 2016; Gabriels et al., 2012). This study did not observe any of the physical areas of functioning but rather focused on their behavior, specifically, irritability, social withdrawal/lethargy, stereotypy, hyperactivity/noncompliance, and inappropriate speech. The results confirmed that THR produced decreases in social withdrawal/lethargy severity symptoms. The results did not confirm that there were statistically significant improvements in the other four sub-scales, but by examining the results, there are trends that may suggest increased severity of stereotypy. Though each item may be ranked differently in the pre-assessment than the post-assessment, the total score for the sub-scales showed an increase in 4, a tie in 3, and none showing a decrease. When examining the total raw scores for each individual, four out of five saw a total score decrease of 1-6 and one remained the same. Meaning, that the decreases in social withdrawal/lethargy were substantial enough to outweigh the increases in stereotypy and hyperactivity/noncompliance.

The specific cause of the decrease in social withdrawal and lethargy symptoms is difficult to determine by using the assessment alone. The rider attends a class with the same individuals and works with the same horse each week, so the rider may gain a sense of security and comfort.

The riders are provided with an opportunity to interact with others and complete tasks by observation. When seeing another rider complete an activity, they could be motivated by their success and become eager to do the same. A positive environment full of energy, internal and external motivators, and a sense of accomplishment and independence could also be features leading to an increase in energy levels of those participating.

There are many potential factors contributing to the lack of statistically significant results of the other four sub-scales. The sample size for this study was small (n=5). A small sample size limits the study to a smaller percentage of the population and increases the variability. Larger samples will increase the authenticity and precision of a study's results because it is observing a greater number of the population, therefore giving a better overview of the entire population's potential outcomes. Due to the small number of participants, it is possible that observing a different sample within the same population would yield a different result.

All of the children of the participants in this study have attended the program in previous semesters, which could have an impact on potentially greater results when comparing the findings in this study to those who are starting the program for the first time. ASD severity for the sample ranged from mild (1) to severe (3), with impairments in areas such as visual, speech and language, intellect, and in one case, physical. The parent reporting a mild (1) severity rating for their child assessment was the assessment that remained the same. This was a quantitative experiment but during an email correspondence with the parent, they felt the need to state, "I wish I could have participated in this study the first semester (they) started. I do feel therapeutic riding helped him in so many ways. I feel because of the horse therapy, he is where he is." Many participants stated that the symptoms being monitored in this study showed greater decreases in severity during their first year of taking part in the program. One participant stated, "I can tell which days she attends (the facility), because her behaviors are much better that day."

**Recommendations for Future Research**

Although the results of this study were only successful in finding a relationship between THR and ASD symptoms in social withdrawal/lethargy, there was a trend for increase in the sub-scale of stereotypy. Considering that those with ASD express a distinct lack of social awareness and communication, the inability to maintain direct attention, mood complications, intolerance of change, and substantial deficits in sensory integration (Bass, Duchowny, & Llabre, 2009; Harfterkamp, Buitelaar, Minderaa, van de Loo-Neus, van der Gaag, & Hoekstra, 2014) it would appear to be beneficial for an individual with ASD to participate in an intervention that incorporates a variety of modalities. THR programs primarily offer group interventions requiring interactions with fellow riders, volunteers, and the horse. The riders are given numerous tasks with a variety of required steps to challenge their ability to follow instruction and maintain attention. The riders know that if they are displaying behaviors that are inappropriate for riding, they will be removed from the horse and asked to return when they have calmed down. Therefore, they must learn to regulate their mood to participate. Many days, especially during the spring and winter months, the group is unable to go outside. If a rider is used to partaking in the intervention outside, they must learn to cope with the change and move to a more, well suited environment for the activities. The horse itself, provides an opportunity to incorporate sensory stimulation in addition to the many other items used within the interventions.

Many of the participants reporting reductions in symptom severity and mood improvements in their child on days when attending the program. Another potential way to expand this study in the future would be to add additional intervention days into the 8-weeks. Instead of doing a single THR intervention, incorporate two days in each week. This would allow less time between sessions and could decrease the likelihood of forgetting skills the riders learned previously. It could also benefit the riders because they are given an extra day to participate in something they enjoy while practicing their skills.

The researcher did not obtain details about specific interventions used, only evaluated the outcomes of the program already in place. It is unclear if interventions used during the sessions were designed specifically to the areas of irritability, social withdrawal/lethargy, stereotypy, hyperactivity/noncompliance, or inappropriate speech, but the addition of those specialized interventions may have yielded greater decreases in the reported sub-scores. For example, incorporating interventions that are designed to address a child's ability to maintain attention or interact with other riders.

It would be advantageous for future studies to recruit parents of children participating in a therapeutic horseback riding program for the first time to measure the child's symptom severity ranking prior to ever participating in a THR program. This would allow future researchers to get a clearer picture of the impact THR had on the changes in symptoms. In addition to recruiting parents of children participating for the first time, one might consider including gender, ethnicity, and economic level within the demographics to get a wholistic view of factors impacting the results.

Broadening the sample field and reaching out multiple facilities would not only increase the size, but also diversify the sample. This would allow the researcher to examine each facility's overall results in addition to the individual results of each participant. Results could then be used to determine which facility produced the greatest results and how their techniques and interventions generated them.

There are few studies exploring the outcomes of THR programs. This study examined the results of the ABC-C assessment of five children with ASD before and after participating in an 8-week THR program. This study provided an overview of ASD symptomology, the requirements of a THR program, the intervention results, and recommendations for future studies. Regardless of whether all sub-scales within this study reported statistically significant results, it can be used

to aid other researchers in further evaluation of the effect of THR on ASD symptoms and raise awareness for the potential benefits of participating in this intervention.

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# APPENDICES

## Appendix A

## IRB Approval

## Oklahoma State University Institutional Review Board

| | |
|---|---|
| Date: | 09/25/2019 |
| Application Number: | ED-19-123 |
| Proposal Title: | Therapeutic Horseback Riding and its Effect on Problem Behaviors in Children with Autism Spectrum Disorder |
| Principal Investigator: | DeAmber Barrett |
| Co-Investigator(s): | |
| Faculty Adviser: | Tim Passmore |
| Project Coordinator: | |
| Research Assistant(s): | |
| Processed as: | Exempt |
| Exempt Category: | |

**Status Recommended by Reviewer(s): Approved**

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The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in 45CFR46.

**This study meets criteria in the Revised Common Rule, as well as, one or more of the circumstances for which continuing review is not required. As Principal Investigator of this research, you will be required to submit a status report to the IRB triennially.**

The final versions of any recruitment, consent and assent documents bearing the IRB approval stamp are available for download from IRBManager. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be approved by the IRB. Protocol modifications requiring approval may include changes to the title, PI, adviser, other research personnel, funding status or sponsor, subject population composition or size, recruitment, inclusion/exclusion criteria, research site, research procedures and consent/assent process or forms.
2. Submit a request for continuation if the study extends beyond the approval period. This continuation must receive IRB review and approval before the research can continue.
3. Report any unanticipated and/or adverse events to the IRB Office promptly.
4. Notify the IRB office when your research project is complete or when you are no longer affiliated with Oklahoma State University.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact the IRB Office at 405-744-3377 or irb@okstate.edu.

Sincerely,

Oklahoma State University IRB

## Appendix B

## Study Welcome Letter

Hello all,

My name is DeAmber Barrett and I am a master's student at OSU. I'm looking to complete the research for my thesis at Turning Point Therapeutic Riding Center in hopes of bringing awareness to the incredible benefits of Therapeutic Riding. If your child is between the ages of 5 and 18, and has been diagnosed with Autism Spectrum Disorder, you are eligible for participation in this study. It is completely voluntary, confidential, and you may stop at any time. The study will be 8 weeks and will not entail any additional requirements other than a consent form and a pre- and post-assessment questionnaire ranking the severity of problem behaviors your child exhibits. The assessment being used is the Aberrant Behavior Checklist-Community which is a checklist that can be administered by a parent/caregiver, special educator, or anyone with extensive knowledge of the behaviors of the individual that is being assessed. It measures their behaviors of irritability, lethargy, stereotypic behavior, hyperactivity, and inappropriate speech.

Therapeutic Horseback Riding is not currently classified as an evidence-based practice and I think that needs to change. The research shows physical benefits in muscular strength, balance, flexibility, and coordination. It encourages teamwork, improves self-confidence, and may improve social, conversational, and verbal skills. It achieves all of this while getting the participant moving. There is an abundance of research supporting physical activity and the positive impacts it has on reducing stress, anxiety, and depression, essentially improving their overall mood. All leading to a higher quality of life gained within an enjoyable therapeutic intervention.

Appendix C

Consent Form

Participant Consent Form Does Therapeutic Horseback Riding Improve Problem Behaviors in Children with Autism Spectrum Disorder Consent to take part in research

I…… voluntarily agree to let my child participate in this research study.

I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.

I understand that I can withdraw permission to use data from my interview within two weeks after the survey, in which case the material will be deleted.

I have had the purpose and nature of the study explained to me in writing and I have had the opportunity to ask questions about the study.

I understand that participation involves completing a pre-, mid-, and post-program assessment form.

I understand that I will not benefit directly from participating in this research.

I understand that all information I provide for this study will be treated confidentially.

I understand that in any report on the results of this research my child and I's identity will remain anonymous. This will be done by changing my name and disguising any details which may reveal my identity or the identity of people I speak about.

I understand that if I inform the researcher that myself or someone else is at risk of harm they may have to report this to the relevant authorities - they will discuss this with me first but may be required to report with or without my permission.

I understand that signed consent forms completed surveys will be kept on a password protected computer until December 2019, after thesis completion has been approved.

I understand that under freedom of information legalisation I am entitled to access the information I have provided at any time while it is in storage as specified above.

I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

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Signature of participant Date

Appendix D

Assessment Explanation

The Aberrant Behavior Checklist-Community is an assessment used to rate the problem behaviors of children and adults with developmental disabilities. You will be asked to reflect on the behavior of your child and complete the assessment prior to starting the program, after completing the fourth week, and after completing the eighth week. Your child will participate in the Turning Point Therapeutic Riding Center program exactly as you planned and aside from the consent form and assessments, no further action will be needed.

The problem behaviors evaluated are:

- Irritability – mild to severe outward displays of disordered behaviors potentially resulting in violent actions.
- Social Withdrawal – lacking the tendency to interact with others.
- Stereotypic Behavior – repetitive behaviors for no apparent reason.
- Hyperactivity/Noncompliance – condition of being constantly and abnormally active which may be a disruptive behavior primarily present in children and failure to do what is asked of them.
- Inappropriate Speech – speaking in a way that is not suitable for the situation. Responses may be unrelated, hard to comprehend or simply echoing what was previously stated.

Your completed assessments will be confidential and stored in a password protected computer. Names will be changed before any information is used to report results in thesis and thesis defense presentation. Any identifiable information will be disposed of properly after thesis defense has been completed and approved, December 2019. You will be able to access any information you provided at any time before disposal. If you have any questions you may contact myself or my supervisor.

DeAmber Barrett

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Tim Passmore

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Appendix E

Snip of items 1-20 of the Aberrant Behavior Checklist - Community

| | | | | | |
|---|---|---|---|---|---|
| 1. | Excessively active at home, school, work, or elsewhere | 0 | 1 | 2 | 3 |
| 2. | Injures self on purpose | 0 | 1 | 2 | 3 |
| 3. | Listless, sluggish, inactive | 0 | 1 | 2 | 3 |
| 4. | Aggressive to other children or adults (verbally or physically) | 0 | 1 | 2 | 3 |
| 5. | Seeks isolation from others | 0 | 1 | 2 | 3 |
| 6. | Meaningless, recurring body movements | 0 | 1 | 2 | 3 |
| 7. | Boisterous (inappropriately noisy and rough) | 0 | 1 | 2 | 3 |
| 8. | Screams inappropriately | 0 | 1 | 2 | 3 |
| 9. | Talks excessively | 0 | 1 | 2 | 3 |
| 10. | Temper tantrums/outbursts | 0 | 1 | 2 | 3 |
| 11. | Stereotyped behavior; abnormal, repetitive movements | 0 | 1 | 2 | 3 |
| 12. | Preoccupied; stares into space | 0 | 1 | 2 | 3 |
| 13. | Impulsive (acts without thinking) | 0 | 1 | 2 | 3 |
| 14. | Irritable and whiny | 0 | 1 | 2 | 3 |
| 15. | Restless, unable to sit still | 0 | 1 | 2 | 3 |
| 16. | Withdrawn; prefers solitary activities | 0 | 1 | 2 | 3 |
| 17. | Odd, bizarre in behavior | 0 | 1 | 2 | 3 |
| 15. | Disobedient; difficult to control | 0 | 1 | 2 | 3 |
| 19. | Yells at inappropriate times | 0 | 1 | 2 | 3 |
| 20. | Fixed facial expression; lacks emotional responsiveness | 0 | 1 | 2 | 3 |

VITA

DEAMBER RAE BARRETT

Candidate for the Degree of

Master of Science

Thesis: DOES THERAPEUTIC HORSEBACK RIDING IMPROVE SYMPTOMS IN CHILDREN WITH AUTISM SPECTRUM DISORDER

Major Field: Leisure Studies

Biographical:

Education:

Completed the requirements for the Master of Science in Leisure Studies at Oklahoma State University, Stillwater, Oklahoma in May, 2020.

Completed the requirements for the Bachelor of Science in Kinesiology at University of Central Oklahoma, Edmond, Oklahoma in May, 2017.

Experience:

Recreational Therapy Senior Intern St. Anthony Behavioral Health Unit Aug 2019-Dec 2019

Recreational Therapy Junior Intern Alliance Health Midwest City June 2019-Aug 2019

Professional Memberships:

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