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Social Functioning in Autism Spectrum Disorder: The Effects of Equine-Assisted Activities

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Social functioning in autism spectrum disorder: The effects of equine-assisted activities

By

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Social functioning in autism spectrum disorder: The effects of equine-assisted activities

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This pilot study examined the effect of participation in an equine-assisted activities (EAA) program on the social functioning of participants with autism spectrum disorder (ASD). Pre- and post-assessments via the Naples Equestrian Challenge Participant Initial Evaluation were completed by a trained Certified Therapeutic Riding Instructor prior to and at the conclusion of a 12 week EAA program. 12 individuals (75% male; *M* age = 10.8; age range 5 – 20 years) participated. Paired-sample *t*-tests were conducted to examine the impact of EAA on social functioning. Analyses revealed that involvement in the EAA program resulted in a significant improvement in social functioning, but when grouped by age (5 – 10 years old, 10 – 20 years old) the effects were not significant. Lastly, individual analyses indicated that 75% of the sample had improved social functioning scores after participation in the EAA program. Results support EAA as an effective therapy for persons with ASD.

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CHAPTER I

INTRODUCTION

Introduction

Autism spectrum disorder (commonly referred to as ASD or autism) affects 1 in 68 children in America (Centers for Disease Control and Prevention, CDC, 2016), making it the fastest-growing developmental disability in the country (Hidalgo, McIntyre & McWhirter, 2015; Mississippi Autism Advisory Committee, MAAC, 2015). Some estimates suggest an even higher prevalence of 1 in 45 (MAAC, 2015), and data shows that individuals in every state in America is impacted by this disorder. The Mississippi Autism Advisory Board reports that almost 11,000 children in the state have an ASD diagnosis (MAAC, 2015), with the Mississippi Department of Education estimating a 563% rise in autism diagnoses of public school children in just the last decade (MAAC, 2015). While the increase does raise cause for concern, this dramatic growth may be largely in part due to higher awareness of ASD symptoms and increased early intervention screenings (MAAC, 2015). Although individuals of all races, socioeconomic statuses, geographic locations, and genders are affected by autism, white children, males, and children from higher SES backgrounds have a higher prevalence of diagnosis than their counterparts (CDC, 2016; MAAC, 2015).

Autism spectrum disorder (ASD)

ASD is a developmental disorder defined by a combination of deficits in social communication, sensory processing, prosocial behavior, and motor functioning (Bass, Duchowny, & Llabre, 2009; CDC, 2016). Autism cannot be diagnosed through medical tests, rather, it is identified through a developmental screening and comprehensive evaluation. These tests are administered by qualified professionals such as teachers, nurses, social workers, psychologists, and doctors (CDC, 2016). The clinical diagnosis must be determined by a pediatrician, child neurologist, child psychiatrist, or child psychologist by way of comparing the results of the comprehensive evaluation with the ASD criteria in the Diagnostic and Statistical Manual of Mental Disorders (CDC, 2016). The American Academy of Pediatrics recommends that children be screened for delays and disabilities at 9 months, 18 months, and 24-30 months and that children be screened specifically for ASD between 3-4 years of age (CDC, 2016). Some signs of autism can be detected before the child's first birthday. ASD can be reliably diagnosed by age two, however, most children are not diagnosed until age 4 or later (CDC, 2016).

ASD was previously believed to be the result of cold, affectionless parenting (termed "refrigerator mothers") (Chown & Hughes, 2016). Even now, there is the misconception that autism is caused by environmental factors and teratogens, mainly vaccinations. However, the research has consistently demonstrated that there is no correlation between vaccinations and ASD (CDC, 2016). What the literature does report is that there is no hard-and-fast predictor for ASD, but experts believe that genes are the main cause of the disorder (CDC, 2016). Still, the CDC argues that there is strong evidence for a higher risk of ASD for children of older parents (2016). Additionally, it is

suspected that family history of immune disorders and pregnancy-related factors (e.g. low-birthweight, medications, preterm delivery) may also be a predictor of autism (CDC, 2016). Thus, current knowledge suggests that genetic factors predispose children to ASD, but that events which occur prenatally or during the very early stages of development alter early brain development and result in varying degrees of symptoms, skills, or levels of disability.

There is a myriad of traditional therapies available to individuals with ASD and their families, including speech services, physical and occupational therapy, behavioral intervention, counseling, and individualized cognitive therapy. These therapies may be beneficial because they allow the patient to focus specifically on building skills in one domain (e.g. fine motor, speech) through targeted therapy with a highly-qualified professional. Though these interventions are valuable, individuals with autism could potentially benefit from an alternative therapy that addresses needs in all developmental domains simultaneously. Thus, the focus of this paper is to evaluate equine-assisted activities as a potential comprehensive therapy for ASD populations, specifically as it relates to social functioning.

Statement of the problem

As previously stated, ASD is a developmental disorder defined by a combination of deficits in social communication, sensory processing, prosocial behavior, and motor functioning (Bass et al., 2009; CDC, 2016). Because ASD affects multiple domains of development, a comprehensive therapy approach that addresses each domain is needed (Bass et al., 2009). Equine-assisted activities (EAA) provides the opportunity for a multi-sensory therapeutic experience that stimulates physical, psychological, and social

development (Ward, Whalon, Rusnack, Wendell, & Pachall, 2013), making it a beneficial therapy alternative for ASD populations (Anderson & Meints, 2016; Bass et al., 2009; Gabriels et al., 2011; Ward et al., 2013).

Although equine-assisted activities have been documented as an effective therapeutic outlet (Anderson & Meints, 2016; Bass et al., 2009; Gabriels et al., 2013; O'Haire, 2013; Ward et al., 2013), there are still many gaps in the literature. First, studies on the effects of EAA specifically with people of all ages with ASD are sparse (Anderson & Meints, 2016; Bass et al., 2009; O'Haire, 2013; Ward et al., 2013). Second, most of the literature consists of studies that simultaneously address general improvements observed, rather than focus on one specific domain in depth. Furthermore, the effects of equine-assisted activities specifically on social functioning in ASD is a topic that is considerably under-researched (Bass et al., 2009; Gabriels et al., 2011; Ward et al., 2013). Finally, much of the current literature is based on qualitative and anecdotal results (Bass et al., 2009, O'Haire, 2013). For this reason, there is an increasing call for more quantitative studies that document the benefits of equine-assisted activities (Gabriels et al., 2011).

Background of study

This study will focus on EAA as a means of therapy for individuals with autism, specifically as it relates to social functioning. The overarching goals of EAA are to benefit the cognitive, physical, social, behavioral, and emotional domains in special needs populations (Anderson & Meints, 2016) and facilitate "therapeutic bonds" between the rider and horse (Bass et al., 2009). For the purposes of this study, EAA will be

defined as an umbrella term that includes therapeutic horseback riding as well as horse-related activities such as grooming (Gabriels et al., 2011).

The use of horses in therapeutic activities as opposed to other animals has benefits well-documented in the literature (Stock & Kolb, 2016). EAA has been utilized in other fields, such as psychotherapy and medicine (Stock & Kolb, 2016). The very presence of a horse is believed to be therapeutic, as a rider may find comfort in the horse's size, rhythmic movement, body warmth, and calmness (Borioni et al., 2011; Gabriels et al., 2015; Holm et al., 2013).

Additionally, horses have consistently been shown to detect human emotions and respond by "mirroring" body language (Anderson & Meints, 2016; Gabriels et al., 2011; Holm et al., 2013).

Purpose of the study/research objectives

The purpose of this quasi-experiment pilot study is to investigate the potential benefits of EEA as an alternative therapy to address social functioning in participants with ASD. The objective of this study is to explore the effects of a certified 12-week EEA program on the social functioning of children and adolescents with autism spectrum disorder. Additionally, the results of this pilot study will be used to inform the equine-assisted activities program from which the participants of this study were drawn and provide guidance for future research with this program. Based on the qualitative and anecdotal evidence available on EAA therapies and participants with special needs, it was expected that participation in the EEA program would enhance the social functioning of children with ASD.

Significance of the study

This study has multiple implications for parents, practitioners, researchers, and most importantly, individuals with autism. First, this pilot study will begin to fill the literature gap in understanding if EAA therapies have the potential to improve the outcomes of children with autism, specifically in regards to the understudied area of social functioning. Additionally, the results will also build on the scant quantitative data available on EAA therapies, which addresses a call in the literature. Further, EAA therapies are not commonly recognized as potential therapies for ASD populations (e.g., few practitioners are aware of the programs; insurance does not cover costs of participation), but if improvements are found the results may support EAA as a viable alternative therapy for people with ASD, which in turn practitioners/insurers may be more likely to encourage pursuit of EAA to families affected by ASD.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

In this chapter, the current ASD and equine-assisted activities (EAA) literature will be discussed. This literature review will address findings about ASD deficits and their implications for appropriate social functioning. Then, an overview of the traditional therapies for ASD symptoms as well as traditional therapies for social functioning deficits specifically will be given. Next, EAA benefits will be discussed as an alternative to the preceding traditional therapies. A summary of the three existing EAA and social functioning studies will then be followed by a section outlining potential explanations for EAA benefits. Finally, the chapter will conclude with the theoretical framework chosen for this research.

ASD

ASD is a complex disorder that is thought to derive by an interaction of genes and the environment, the latter of which would include the prenatal or very early stages of development (Autismspeaks.org). This interplay between the genetic predisposition and the environment impact early brain development, which can lead to varying degrees of difficulties in several developmental domains. ASD is characterized by stereotypic behaviors, disrupted emotional regulation, impaired motor functioning, deficits in

language and communication, atypical sensory integration, and attention deficits, all of which have implications for social skills and social information processing.

Stereotypic behaviors in autism include hand flapping, echolalia and fixated interests (e.g. trains, telephone numbers, weather) (Cunningham & Schreibman, 2008). Stereotypic behaviors may occur as a person with ASD becomes over- or understimulated (e.g. rocking, spinning, putting foreign object in mouth) as a way of processing and managing sensory input (Cunningham & Schreibman, 2008). These stereotypic behaviors set children with ASD apart from others and could contribute to social isolation.

Disrupted emotional development is also a symptom of ASD, with affected individuals displaying difficulty regulating and expressing their emotions, as well as interpreting others' emotions. Emotion regulation, as defined by Mafesky and colleagues (2013), is the "automatic or intentional modification of a person's emotional state that promotes adaptive or goal-directed behavior" (p. 2). It is a person's ability to respond appropriately to a situation, suppress socially improper reactions, and return to their emotional baseline after a change in emotions (e.g. anger, excitement) without the help of another person. People with ASD also tend to exhibit unusually high levels of anxiety (Mafesky et al., 2013). Social competence is based in one's ability to appropriately respond to cues in the social environment, and given the challenges children with ASD face with interpreting social cues and expressing emotions in response to those cues, children with ASD face grave difficulties in social functioning.

In regards to motor functioning impairments, two common symptoms of ASD are dyspraxia and proprioceptive dysfunction (Dziuk et al., 2007). Dyspraxia is defined an

impairment of motor skills and coordination and is well-documented in ASD (Dziuk et al., 2007). These motor impairments can be detected as early as infancy, with young children demonstrating difficulty crawling and walking as well as poor posture, clumsiness, and low muscle-tone (Dziuk et al., 2007). Proprioception is defined as a person's perceived limb position (Paton, Hohwy, Enticott, 2012). In essence, proprioception is a person's body awareness and spatial reasoning. In ASD populations, proprioception is disrupted and individuals have difficulty sensing their body's orientation in time and space (Paton et al., 2012). These motor function impairments can have social implications for children with ASD. For example, children with ASD often do not understand personal space and they can have difficulty engaging in physical play with other children.

Childhood Apraxia of Speech (CAS) is an interruption in the brain's messages to the facial muscles, tongue and jaw to form syllables and sounds (Shriberg, Paul, Black, & van Santen, 2010). CAS is characterized by deficits in precision and consistency of speech sounds. Research has shown that while people with ASD have a modestly higher prevalence of speech delay, they have a significantly higher rates of speech errors. Additionally, people with ASD demonstrate echolalia (meaningless repetition of sounds), inappropriate volume and pitch, and misplaced stress (Shriberg et al., 2010). For these reasons, CAS may contribute to a person's ability to effectively communicate wants and needs, as well as their capacity to hold conversation with a peer.

Individuals with ASD have unique sensory integration processes and needs can typically be categorized as either sensory-avoiding (hypersensitivity) or sensory-seeking (or hyposensitivity). These varying levels of sensory sensitivity is correlated with a

person's sensory threshold. For example, an individual with a low threshold for sensory input would be considered hypersensitive (Schauder & Bennetto, 2016). Overstimulation may manifest itself through sensory-avoiding behaviors such as covering ears, overreaction to noise, turning off lights, having an aversion to clothes tags, and dislike brushing their teeth. A person who is hyposensitive may have a very high tolerance of pain and noise, seek pressure (squeezing between furniture or small spaces), and exhibit clumsiness (Sicile-Kira, 2014). Additionally, persons with ASD have difficulty integrating sensory information fluently. For example, a child with ASD may have high auditory sensitivity and experience inputs like music, nearby conversation, or sudden noises with extreme intensity without difficulty processing visual or tactile inputs (Sicile-Kira, 2014). Thus, children with ASD may be unable to attend or have a difficult time engaging in social events (e.g., football game, dance class) due to their sensitivity to noise.

Often comorbid with ASD is ADHD (Rao & Landa, 2013). ADHD and autism often have overlapping symptoms, including communication and behavioral problems. Most notably, however, is attention deficits. The research indicates that a combination of these disorders causes significant implications for adaptive behaviors, social learning, education, and psychosocial development. Additionally, Rao and Landa report that comorbidity translates into more severe manifestation of autistic traits (2013).

Explanations for Social Functioning Deficits

In order to more closely explore the causes and implications of social functioning impairments, deficits first must be identified and explained. Social functioning, as defined by Anderson and Meints, is the "ability to construct representations of relations

between oneself and others, and to use such representations to model social behavior" (p. 2). As compared to their typically-developing peers, people with ASD have atypical patterns of social functioning (Ziv, Hadad, & Khateeb, 2014). Impairments are characterized by gaze aversion (O'Connor & Kirk, 2008), difficulty understanding others' perspectives and intentions (Anderson & Meints, 2016), inappropriate responses to social stimuli (Ziv et al., 2014), lack of social awareness (Anderson & Meints, 2016), and decreased motivation to engage with others (Mundy, Mastergeorge & McIntyre, 2012).

There are several theorized causes of social functioning deficits in ASD. From a biological standpoint, it has been documented that people with ASD have atypical neuroanatomy (Chevallier et al., 2012). For example, the cerebellum of an ASD brain is found to be larger and malformed compared to control brains (Amaral et al., 2008; Bass et al., 2009; O'Connor & Kirk, 2008). Because the cerebellum plays a significant role in social and emotional functioning, anomalies in cerebellar development could account for social functioning issues observed in ASD populations (Bass et al., 2009; Ward et al., 2013). Additionally, amygdala enlargement in ASD brains has also been documented, and could have a negative effect on stress management and communication skills (Amaral et al., 2008). Thus, a person with ASD may be intrinsically predisposed to social functioning deficits.

Another explanation for impeded social functioning is atypical sensory integration. Unique sensory processing patterns are a hallmark feature of autism, and people with the disorder are more likely to have intense sensory sensitivity (Iarocci & McDonald, 2006). Additionally, while typically-developing people are able to

concurrently experience multiple types of sensory inputs with fluency, people with ASD have difficulty integrating several inputs simultaneously (Iarocci & McDonald, 2006). Indeed, researchers have found that people with ASD demonstrate preferences for certain types of sensory inputs at certain levels (Iarocci & McDonald, 2006; Mottron et al., 2006; O'Connor & Kirk, 2008). For example, during a face-to-face interaction in a noisy cafeteria, a child with autism may be so overwhelmed by the flickering fluorescent overhead lights or the sound of banging lunch trays that he or she may unable to completely attend to their peer's conversation. Thus, sensory sensitivities can be intense enough to not only deter an individual with ASD from seeking out or participating in social communication, but also impact the person's ability to have meaningful interactions and build relationships (O'Connor & Kirk, 2008).

Finally, attention deficits may also contribute to social functioning problems in ASD. Joint attention is defined as "the ability to share a common point of reference" with a social partner (Mundy & Newell, 2007, p. 1), and Mundy posits that humans naturally engage in two types of joint attention: initiating joint attention (IJA) and responding to joint attention (RJA) (Mundy & Newell, 2007). However, individuals with autism demonstrate chronic deficits in IJA and RJA, meaning that they are less likely to coordinate their attention and establish a common frame of reference with another person (e.g. approaching an adult to show a new toy truck, following a parent's eye gaze to an object) (Mundy et al., 2012). This creates an issue in terms of social development, as a common frame of reference is the cornerstone of social learning. Indeed, if an individual and their social partner are not attending to the same object or stimuli, the potential for social connection and learning is hindered (Mundy et al., 2012). For example, if a group

of children in a classroom are playing together and a student with ASD does not actively align his attention to what the other children are talking about and looking at, he misses out on a valuable opportunity to engage in (and learn from) age-appropriate play with his peers.

The aforementioned causes of social functioning impairment provide insight into the multiple barriers that people with autism must overcome to appropriately and effectively interact with others. Not surprisingly, these barriers result in missed opportunities for social learning (Mundy et al., 2012). Ziv, Hadad, and Khateeb (2014) suggest that humans have a mental "database" for social responses that we build over time based on past interactions, social rules, and knowledge of acceptable and unacceptable behaviors. Humans unconsciously rely on this database to inform decisions about how to respond appropriately in a social interaction. However, if a person with ASD has not had adequate opportunities to learn positive social skills, he or she does not have a robust database from which to retrieve prosocial response options (Ziv et al., 2014). Moreover, this can translate into inappropriately responding to a social stimulus, trouble relating to peers, and difficulty building and maintaining relationships (Ziv et al., 2014).

The symptoms of autism do not occur in a vacuum. Each symptom is not only an issue in and of itself, but has implications for healthy development in all domains. A prime example is with social functioning in ASD. As with motor functioning, proprioceptive dysfunction may translate into invasion of personal space, while dyspraxia may impact a child's ability to play alongside their peers or join in common activities. Disruptions in language development have implications for meaningful interactions with

peers and adults. Although it is possible to communicate non-verbally, a person's ability to use appropriate spoken language is important to social interaction. Additionally, because individuals with ASD are unable to fluently experience several sensory inputs at once, they may experience distress while in social settings (e.g. football game, playground, dance class). Emotions are such an essential aspect of social interactions, thus, deficits in emotional development can influence a person's ability to appropriately socialize with others. Finally, stereotypic and fixation behaviors may cause people with ASD to be alienated from their peers. Indeed, a person's ability to appropriately engage with peers, express and regulate their emotions, and suppress anxiety and pervasive behaviors contribute to their capacity to build and maintain meaningful human relationships.

ASD deficits and traditional therapies

People with autism typically require some form of therapy or intervention to address motor, language, and sensory processing delays. Physical therapy (PT) is a therapy geared toward improving gross motor impairments and is administered by a licensed physical therapist. To address fine motor delays, an occupational therapist will administer occupational therapy (OT). Speech-language therapy (SLT) is provided by a speech-language pathologist and addresses delays in language development and communication. Sensory integration therapy is typically administered by an occupational therapist and is designed to improve a person's ability to understand and consolidate several sensory inputs simultaneously (Boutout & Tincani, 2009). Finally, the key to successfully managing ASD and thus improving the lives of children with the disorder is early detection and active engagement in treatment. Early intervention is a service

dedicated to identifying delays and disabilities in young children and securing aids and therapies for promoting optimal development. It is the first line of defense and the most important step in combating pervasive ASD symptoms.

Traditional therapies for social functioning

Social functioning impairments can have significant effects on a person's quality of life, thus, active treatment is necessary. There are several common forms of therapy for addressing social functioning deficits in populations of people with general disabilities, including social skills groups, "social thinking", and Cognitive Behavioral Therapy (CBT), and Positive behavioral interventions and supports (PBIS) (Morin, n.d.). Among the most popular socio-emotional therapies for ASD populations is applied behavioral analysis (ABA), pivotal response treatment (PRT), and developmental, individual-difference, relationship-based treatment (DIR). ABA is based on operant conditioning and utilizes positive reinforcement. Strategies include repetition, praise, and material and edible rewards. ABA is an intensive therapy (20+ hours/week) and is typically expensive. PRT is an intervention that uses the principles of ABA and focuses on improving natural social behaviors. PRT is administered in the child's familiar, natural environments and employs spontaneous opportunities to teach appropriate responses to social stimuli. Developmental, individual-difference, relationship-based (DIR), also known as "floortime", is a therapy that utilizes relationships to build social skills in people with ASD. Floortime involves the parent getting on the child's level and following their lead. Through child-directed activities, spontaneous opportunities for play, and intentional employment of facial animation, parents are trained to engage with their child in ways that are meaningful and unobtrusive (Deflippis & Wagner, 2016).

Equine-Assisted Activities (EAA)

Therapeutic horseback riding involves mounting the horse, controlling and steering the horse through verbal and nonverbal cues, learning and practicing riding skills, and dismounting the horse. While on horseback, riders participate in a number of activities designed to address their individual needs. These activities vary depending on the rider, but involve games and exercises geared toward improving social functioning, gross and fine motor skills, language development, communication, and sensory integration (Ward et al., 2013). A team of four people (two side-walkers, a horse leader, and a therapeutic riding instructor) assist the rider during the session (Gabriels et al., 2011).

The horse-related activities involve a range of exercises referred to as "groundwork" (Professional Association for Therapeutic Horsemanship, PATH, 2016). These activities include grooming (cleaning hooves, brushing horse), stable management (sweeping barn, refilling water troughs), and horsemanship (tying/untying horse, identifying grooming brushes) (Anderson & Meints, 2016). Much like therapeutic riding, the goal of groundwork is to facilitate gross and fine motor coordination, social interaction, sensory integration, and language use through hands-on experiences (Smith, 2016).

While other therapies have demonstrated effectiveness, most therapies are designed to focus on one developmental domain at a time. Equine-assisted therapies, on the other hand, is comprehensive and addresses all domains simultaneously. For example, when a rider is refilling a water trough during groundwork, they are interacting with the volunteers while talking about the horse, using their fine motor muscles to twist

the faucet handle, using their gross motor muscles to pick up the bucket, walk to the water trough, and pour the water. Additionally, participants are improving their sensory integration skills as they concurrently experience the feel of water on their hands, the smell of hay, the sound of horses whinnying all whilst interacting with volunteers and completing the task at hand.

EAA and General Disabilities

Among participants with various disabilities, the research shows EAA to be an effective therapy outlet. In terms of physical benefits, the research shows improvements in muscular symmetry, increased balance and range of motion, posture, and stability in participants with cerebral palsy (Shurtleff &Engsberg, 2010). Psychologically, patients demonstrate a decrease in stress and need for pain-relief medication (McConnell, 2002). Riders with learning disabilities show increases in speech and language use, attention, and motivation (Macauley & Gutierrez, 2004). Therapeutic horseback riding also shows a positive effect on children's education. For example, one study's results indicated that after therapy, children demonstrated improvement in academic development and increased personal responsibility (Miller & Alston, 2004).

EAA and ASD

Researchers have consistently reported improvements across domains in ASD populations after participation in EAA. In regards to gross motor functioning, participants demonstrated greater strength, coordination, and straighter posture (Borgi et al., 2015; Holm et al., 2013). Language and communication improvements have also been documented. Indeed, participants exhibited increases in spontaneous verbalization

and expressive language skills following the EAA intervention (Borgi et al., 2015; Gabriels et al., 2011; Holm, et al., 2013). Improvements in attention and decreased distractibility were found in several studies of children and adolescents (Bass et al., 2009; Borgi et al., 2015; Gabriels et al., 2011; Lanning, Baier, Ivery-Hatz, Krenek, & Tubbs, 2014; Ward et al., 2013). Additionally, ASD participants demonstrated improvements in sensory integration (Bass et al., 2009; Ward et al., 2013), autism symptom severity (Kern et al., 2011, Ward et al., 2013), quality of life (Kern et al., 2011), attention (Patterson, 2015), and a decrease in aggression (Gomez et al., 2013) stereotypic behaviors, irritability, and lethargy (Gabriels et al., 2011, Lanning et al., 2014). Based on these studies, EAA seems to be an effective therapy outlet for ASD populations.

EAA and Social Functioning in General Disabilities

There is some evidence to show that equine therapy has an effect on the social functioning of patients with general disabilities and disorders. For example, one study showed horseback riding decreased social isolation and apathy for schizophrenic participants (ages 18-40 years) (Cerino, Cirulli, Chiarotti, & Seripa, 2011). These results were assessed via the brief psychiatric rating scale (BPRS) and the positive and negative symptom scale (PANSS), which capture both qualitative and quantitative data. A separate study found that adults with intellectual disabilities demonstrated greater autonomy and social integration (Borioni et al., 2012). Children with ADHD have also shown improvements in social "qualifications" and a positive change in social contexts (Cuypers et al., 2011). These results were demonstrated via a simplified version of the International Classification of Functioning Disability and Health (ICF) and ICF-Children and Youth (ICF-CY) that was modified for the researchers to quantify the results of

participants' involvement in an equine therapy program. These results suggest that EAA may be a potential candidate for improving social functioning of persons with disabilities.

EAA and Social Functioning in ASD

Ward and colleagues (2013) studied 21 elementary-aged students with autism and their social functioning improvement after an EAA intervention. Their study measured teachers' observations of autism characteristics and sensory responses based on the children's behavior in the classroom. Ward employed an interrupted treatment design: ten consecutive weeks of riding, followed by a six week break, and concluding with eight weeks of riding. In addition to riding therapy, participants had access to sensory bins. Each therapy session included orientation (a sensory activity), mounting and silent riding, riding skills (learning verbal cues, steering), and closure (a socialization activity). Teachers reported on the Gilliam Autism Rating Scale (William et al. 2002) and Sensory Profile School Companion (Brown et al., 2010). Significant improvements were found during the intervention, however these gains were not maintained during the six week treatment interruption, yet were recovered once EAA resumed. Specifically, teachers reported improvements in social communication, attention, and sensory tolerance in the classroom, and higher ability to relate to peers (Ward et al., 2013).

Bass, Duchowney, and Llabre (2009) also completed a study measuring social functioning improvements after EAA. Their sample consisted of 34 children with ASD aged 4-10 years: 19 in the experimental group and 15 in the wait-list control group. The children participated in 12 weeks of therapy. Similar to Ward's experiment, therapy involved horsemanship activities (or groundwork) as well as therapeutic riding. To begin the session, riders mounted the horse and participated in a 10 minute warm-up (i.e., light

stretching). Next, the child practiced riding skills and played educational and therapeutic games while mounted. To conclude the session, participants dismounted the horse and took part in grooming activities. As compared to the control group, improvements in sensory sensitivity and integration, inattention, and social motivation were reported by the participants' parents (Bass et al., 2009) as indicated by the Social Responsiveness Scale (Bolte et al., 2008) and the Sensory Profile (Keintz & Dunn, 1997).

Anderson and Meints (2016) worked with a sample of 15 children and adolescents (ages 5 – 16 years old) over the course of 5 weeks, with each EAA session lasting 3 hours. This design is a stark contrast to the previously mentioned studies, as those interventions lasted for one hour and continued for more weeks. In Anderson's study, participants spent one hour in each activity: therapeutic riding, horsemanship, and stable management. Each activity involved a number of different tasks to be completed. During the therapeutic riding portion of the program, riders lead the horse into the arena, mounted, rode, dismounted, and lead the horse back into the stable. Horsemanship (or groundwork) involved tying the horse to a post, grooming the horse and cleaning its hooves. Stable management tasks included filling water buckets and hay troughs, sweeping the stable, and emptying wheelbarrows. Questionnaires that assessed autism traits, ability to empathize, and adaptive behavior were administered to parents/caregivers of the participants. ANOVA analyses indicated improvements in empathizing and a decrease in maladaptive behaviors (e.g. self-harm tendencies, asocial behaviors) (Anderson & Meints, 2016).

Taken together, these three independent studies suggest EAA is a potential avenue for the improvement of social functioning in ASD populations. However, the limited

number of studies available in the literature, coupled with the diverse program designs and examination of different indicators of social functioning underscore the need for more research in this area. Thus, the current proposed pilot study will add to the literature by assessing the social interactions that occur during the EAA program.

Explanations for Benefits

As previously stated, individuals with ASD exhibit malformed cerebellums, and this has implications for sensory acquisition, attention, and social competency (Shih et al., 2008). Researchers cite cerebellum stimulation as a potential factor in social functioning improvements after EAA, stating that participation in this intervention requires motor movements, coordination, sensory integration, all of which stimulate the cerebellum (Bass et al., 2009; Ward et al., 2013). Thus, through stimulation, social functioning is improved.

Social functioning improvements after EAA intervention may also be due to the calm demeanor and predictable behavior of the horse. Anderson posits that during the interaction with the horse, the participant does not have to simultaneously attend to both verbal and nonverbal cues, making the interaction simpler and the animal's intentions easier to interpret. Additionally, during therapeutic riding, a participant controls the horse's actions through verbal commands, perhaps demonstrating for the rider that their words have meaning and power (Bass et al., 2009).

A common problem in ASD is joint attention (Mundy & Newell, 2007). As previously stated, joint attention is dependent on the shared frame of reference. Therapeutic riding may be beneficial to the social functioning of people with ASD because the horse or the activity becomes the shared frame of reference (Bass et al.,

2009; Ward et al., 2013). The horse and the riding context is the common ground for the volunteers and rider, giving everyone involved a shared experience from which to start conversations and ask questions. The participant has an opportunity to practice joint attention and appropriate social skills in a controlled environment with supportive adults. Thus, the EAA therapy context provides a "safe" space for interaction and social learning (Ward et al., 2013).

Theoretical framework

Social information-processing theory posits that there are several microsteps involved in the selection of a response to a social stimulus (Ziv et al., 2014). First developed by Crick and Dodge in 1984, the social information-processing theory was demonstrated using a linear model. Then, in 1994, Crick and Dodge reformulated the model as a cycle. The current social information-processing model is provided below (see figure 1.). The purpose of the model is to describe the mechanisms that contribute to an individual's social adjustment (Crick & Dodge, 1994).

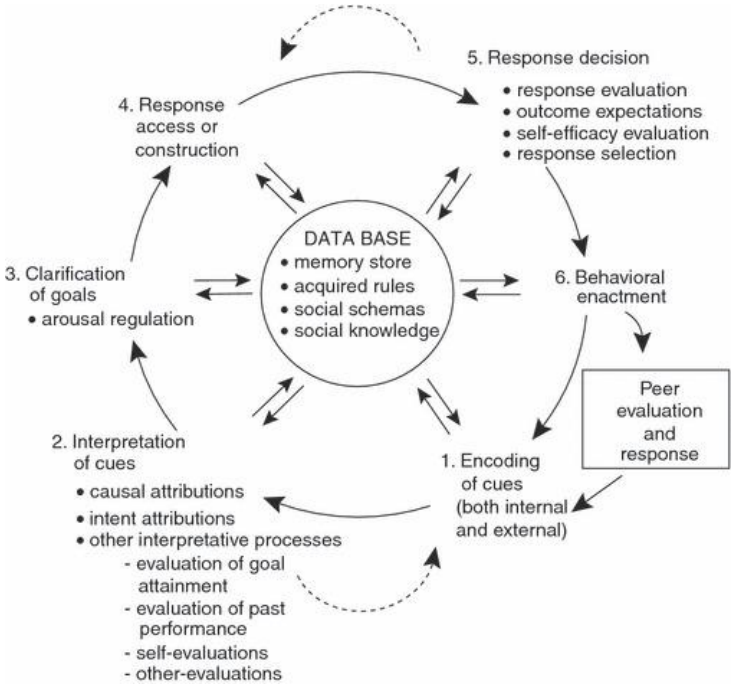

Figure 1 Social information-processing theory model

To understand social information-processing theory, the construct of the mental database must first be discussed. Crick and Dodge hypothesize that all humans have a mental "database" of past social experiences, social rules, and acceptable and unacceptable behaviors (Crick & Dodge, 1994; Flood et al., 2011; Ziv et al., 2014). When an individual is confronted with a social stimulus, they pull from their mental database to choose a behavior that is appropriate and/or will help them meet their goal for the situation. Responses can either be a social response that has been effective in a similar scenario or, if the situation is novel, a new response may be constructed based on the social information stored in the database (Flood et al., 2011; Ziv et al., 2014). For example, if while on the school bus a child is teased by his peer for his new glasses, that child will scan their database for a response to the interaction. The child may choose to

either ignore his peer (a response that has been efficacious for him in similar altercations), or stand up for himself (a response he will construct from past experiences and social rules stored in his database). The database is a crucial component of the model as the social information stored in the database informs every step of the response selection process.

As indicated in the model, there are several microsteps in the social response construction process. These steps are: encoding and interpreting social cues, clarification of goals, response access or construction, response decision and behavioral enactment (Flood et al., 2011). The first step, encoding social cues, occurs when an individual registers a social stimulus (e.g. attractive person of the opposite sex smiling from across the room). Closely interconnected with encoding is the second step, interpretation of the social cue (Flood et al., 2011). During the interpretation of the social cue, several independent processes take place. An analysis of the events leading up to the social cue (e.g. the person made eye contact several times). An individual will assess their social partners' intent while simultaneously recalling memories of past similar scenarios. These processes form a mental representation of the social situation (e.g. recognizing the cue as similar to past experiences of flirting) (Crick & Dodge, 1994).

The third step, clarification of goals, occurs when an individual identifies their desired outcome for the situation (e.g. reciprocate the flirting) (Flood et al., 2016). After choosing the goal, step four is response access or construction. The individual examines their mental database for a potential response (e.g. smiling back at the attractive person or approaching them). Next, an individual will evaluate the responses and choose the most positive one based on potential outcome and how it aligns with their desired goal, degree

of confidence in their ability to achieve that goal, and appropriateness of the response (e.g. the attractive person is sitting with friends and it would be rude to interrupt, thus approaching is not appropriate. Smiling is deemed the most positive response) (Crick & Dodge, 1994). Finally, the individual enacts the behavioral response (e.g. smiling back at the attractive person) (Ziv et al., 2013). Once the response decision has been made and enacted, the person waits for a new cue from their social partner (e.g. attractive person walks over), and the cycle continues with the encoding of that cue (Flood et al., 2011).

Individuals with autism are believed to inaccurately encode social cues (Flood et al., 2011). This in turn disrupts every following step in the social response selection process, thus leading to negative social experiences and by extension, negative social learning (Flood et al., 2011; Ziv et al., 2014). Furthermore, because the theory states that a person's mental database is composed of their past social experiences, an individual with ASD is subjected to a pattern of inappropriate, negative social interactions (Flood et al., 2011). Because the EAA context provides a safe space to practice social interactions and learn positive, appropriate social skills, it is hypothesized that EAA improve the participants' future social behavior. Thus, social information processing theory will be used to frame the social functioning changes observed after participation in EAA.

CHAPTER III

METHODOLOGY

Introduction

The interest of this research was the effect of EAA on the social functioning of individuals with ASD. This study employed pre- and post-evaluations of the EAA participants at the beginning and conclusion of the 12-week EAA program. Effectiveness of the program was assessed based on the comparison of pretest and posttest results. This chapter will begin by explaining the research design. Next, the population, sample, and sampling method will be clarified. Third, variables and measurements will be discussed. Fourth, a review of the step-by-step procedures of the program will be outlined. Finally, the data collection methods and study timeline will be discussed.

Research design

This pre-experimental research used a one-group pretest-posttest study design. The pretest-posttest included a series of observations on social functioning among children diagnosed with ASD participating in a PATH-certified EAA program. This design allowed measurement of social functioning at two points of time, before and at the conclusion of a 12-week EAA program conducted by certified therapeutic riding instructors (CTRIs). This study design is advantageous as it allowed for measurement of social functioning at two points of time (Fraenkel, Wallen, & Hyun, 2015) and provided insight into the efficacy of EAA as a potential therapy for social functioning.

Population/sample

The population for this study is individuals with ASD who participate in EAA in Mississippi. However, there are no estimates on how many people with ASD participate in an EAA program in Mississippi. The accessible population for this study were children with ASD who were involved with the Mississippi State University Equine Assisted Therapy (EAT) Program at the Elizabeth A. Howard Center in West Point, MS who have completed the Naples Equestrian Challenge Participant Initial Evaluation. Everyone in the accessible population was invited to participate in this study. Eligible participants were selected by first identifying the pool of individuals who participate in the EAT program. That pool was then narrowed to participants who have a clinical diagnosis of ASD. All individuals participating in the program who were identified as having ASD, regardless of ASD severity, gender, age, and income-level were included in study. Due to the fact that only one EAA program was selected for the study and that those participants were narrowed down based on an ASD diagnosis, the pilot study included 12 participants (i.e., the number of participants diagnosed with ASD who participated in the program in Fall of 2016). Though 13 participated, only 12 riders had both pre- and post-assessments. Thus, the final sample consisted of 8 boys and 4 girls ages 5- 20 years old (M = 10.83*;* SD = 4.71). All but one rider in the sample (92%) was European American. Additionally, one rider participated in groundwork in addition to riding therapy.

Participants from only one program were chosen for consistency purposes. That is, each EAA program is different in terms of quality (e.g., program delivered by a certified instructor or not), resource availability (e.g., consistency of location or animals;

nonprofit or for-profit), and size (e.g., recruitment methods; availability of specific populations). Additionally, each EAA program involves a different combination of activities, therapy duration, and number of sessions (dosage). Therefore, including participants from several programs would likely not yield consistent results as it would be difficult to control for the treatment (EAA).

Variables/measurements

Social functioning was measured with the Naples Equestrian Challenge Participant Initial Evaluation. This instrument was developed by the staff at the Naples Equestrian Challenge Therapeutic Riding program in Naples, FL as a tool to evaluate participants' progress during their EAA experience. The Naples Participant Initial Evaluation was created by a premier PATH-Certified therapeutic riding center and has been used to assess their more than 500 participants per year since 2013. The instrument contains 35 questions among 5 constructs: Social Skills, Communication Skills, Balance and Posture skills, Balance Skills, and Motor Skills. For this study, only the Social Skills construct responses was used. This Social Skills construct contained seven indicators of social skills: Human Relationship, Engagement, Emotional Expression, Fixation Behavior, Fear and Nervousness, Control of Emotions, and Adaptation to Riding. Each of those indicators were rated by a PATH-certified Therapeutic Riding Instructor (CTRI) on a six-point scale, with 0 representing the inability to score the indicator due to either comprehension problems or a physical difficulty and 5 representing the most optimal outcome provided in the response choices. For example, the indicator of Human Relationship was determined using the following response choices: 0 = unable to score; 1 = will not have any kind of relation with anybody; 2 = cannot ride without a significant

persons sidewalking; 3 = can ride only when a significant person is in view; 4 = can ride without the presence of a significant person; 5 = can communicate positively with instructor, leader, and/or sidewalker. Each indicator score was then be tallied to provide an overall Social Skills score, with 35 as the highest total possible score. The total scores were then interpreted using the following scale: 0 to 5 = inadequate; 6 - 10 = poor; 11 - 15 = needs improvement; 16 - 20 = satisfactory; 21 - 25 = good; 26 - 30 = very good; 31 - 35 = excellent. Demographic information was collected during the pre-test. A simple, open-ended questionnaire was completed by the primary caregiver to capture ASD diagnosis, age, race, gender, and previous riding experience.

EAA Program Procedures

The EAA program consisted of 12 sessions. Riders were scheduled to participate in a one-hour session once a week for 12 weeks. Program procedures were as follows: Week 1: The CTRI conducted the Naples Participant Initial Evaluation via individual observation. After completion of the evaluation, participants were evaluated based on size, temperament, and needs to match them with a therapy horse. Additionally, participants were fitted for an appropriately sized helmet and saddle. Riding did not occur during the first week.

Week 2-12: Participants entered the Elizabeth A. Howard Center and were greeted by the CTRI and volunteers. The participants were then led into the fenced-in riding arena and began the therapy session. Each session consisted of 50 minutes of riding time and the curriculum consisted of goals and activities chosen for each specific rider. Goals were based on the participant's present level of performance and desired level of performance. These goals might include: mounting and dismounting, using

verbal commands to cue the horse, steering, independently adjusting seating position, and using correct posture while riding. Additionally, participants engaged in activities while atop the horse (e.g. number/letter recognition games, gross motor exercises). At the conclusion of the session, the rider was led out of the arena to return their helmet and enjoy a light snack. In the final session, the CTRI completed the post evaluation during riding.

Data Collection Procedures

Parental consent and child assent were administered during the initial evaluation session. The social skills assessment was collected the first week of the EAA program (i.e., pre-data; prior to riding) and during the last week of riding (i.e., post-data). The Naples Participant Initial Evaluation was scored by a CTRI who was trained to conduct assessments with special needs populations. The CTRI observed the participant as they interacted with the people and surrounding environment and this information was used to make the assessments. Observation is the ideal method for data collection because it does not influence or affect the therapy process (Fraenkel et. al., 2015). The participants were not aware of the observation, thus eliminating the potential for altered or biased behavior. The evaluations took approximately an hour to conduct.

Analyses Plan

SPSS version 24 was used to perform descriptive analyses on each of the seven social skills indicators and the total score on the Naples Equestrian Challenge Initial Evaluation both prior to and following participation in the EAA program. The descriptive analyses did not only allow us to understand the degree of social functioning children

exhibited prior to and following the program, but it also allowed us to determine the amount of variability in social functioning and mean level changes. To determine if the EAA program significantly impacted the participants' social functioning scores, paired samples *t*-tests were performed. Additional paired samples *t*-tests examined the effectiveness of the EAA program by age of the participant. Further, individual-level analyses were also conducted to determine the amount of change in social functioning pre- and post-participation for the individual given that participants had varying levels of severity and potential comorbid healthy issues

CHAPTER IV

RESULTS

Analysis Plan

A descriptive analysis was performed to determine the variance of the pre- and post- evaluation scores of riders with ASD. Additionally, a paired samples *t*-test was conducted to assess program effectiveness via the social skills construct of the Naples Equestrian Challenge Initial Evaluation. That is, the changes in social functioning skills of ASD riders were examined before and after the EAA program. Additional paired samples *t*-tests were conducted to determine if these changes varied based on the age of the participant. Finally, individual's change scores from pre-to post-assessments were investigated.

Preliminary Analysis

Cronbach's Alpha was run to assess the reliability of the Naples Equestrian Challenge Initial Evaluation both at the pre- and post-assessments. The scale was found to be reliable with Cronbach's alpha of .80 and .78 respectively. The means, standard deviations, ranges, and change scores of the social functioning variables are presented in Table 1. Initial evaluation results indicated emotional expression to be the biggest challenge for this population in regards to social functioning as measured by the Naples Equestrian Challenge Evaluation. Interestingly, participants in the initial evaluation were scored highest on their lack of fear or nervousness during the session. Post-assessment

results revealed that no mean change was seen on the question regarding the participants' ability to control their emotions, while the greatest change was seen in participants' adaptation to riding. Important to note is that, on average, all components of the social functioning scale showed positive change following participation in the EAT program except for their ability to control their emotions.

Table 1 Paired sample t-test results

	Pre		Post			
	M	SD	M	SD	Range	Δ
1. Human Relationship	3.83	0.83	4.66	0.65	0-5	.83
2. Engagement	3.75	1.05	4.50	0.67	0-5	.75
3. Emotional Expression	3.33	1.15	3.75	1.60	0-5	.42
4. Fixation Behavior 3.75	1.48	4.0	1.20	0-5	.2	
5. Fear and Nervousness	4.58	0.66	4.75	0.45	0-5	.17
6. Control of Emotions	3.75	1.28	3.75	1.20	0-5	.0
7. Adaptation to Riding	3.66	1.23	4.50	0.90	0-5	.84
8. Social Skills Total	26.6	4.55	29.9	5.14	0-35	3.3

Note: M=Mean. SD=Standard Deviation.

Paired samples t-test results

Paired samples *t*-tests were conducted to examine the effectiveness of equine-assisted activities on the social functioning of riders with autism. The results of the *t*-tests are reported in Table 2. Results indicate significant improvements in social functioning for the sample following their participation.

Additional analyses were performed to assess group differences by age. The sample was split into two groups: children aged 5 - 10 years old and adolescents aged 11 - 20 years old. *T*-test results for both age groups revealed no significant changes in social functioning following the EAT program (see Table 2).

Table 2 Paired sample t-test results

	Pre		Post		
	M	SD	M	SD	t
1. All Participants	26.6	4.55	29.9	5.14	-2.2* (df = 11)
2. Children	27.1	4.25	30.2	5.96	-1.5 (df= 6)
3. Adolescents	26.0	5.38	29.4	4.33	-1.4 (df= 5)\

Note: *M*=Mean. *SD*=Standard Deviation.
*p <.05.

Individual Level Analyses

To further examine the effectiveness of the EAA program on children's social functioning, individual's change scores were investigated. These results are presented in Table 3. Of note, 75% of the sample showed improvements in social functioning after their participation. Results indicated three participants (all male) scored lower in social functioning following the EAT program; one of which was a substantial decrease (i.e. -7 points). The greatest positive change was seen in a female child (i.e. 10 points).

Table 3 Individual Analyses

	Age	Gender	Pre	Post	Δ
Participant 1	6	F	21	26	5
Participant 2	14	F	21	29	8
Participant 3	10	F	32	35	3
Participant 4	17	M	33	31	-2
Participant 5	13	M	30	35	5
Participant 6	10	M	32	35	3
Participant 7	20	M	25	23	-2
Participant 8	15	M	21	29	8
Participant 9	7	M	26	19	-7
Participant 10	5	M	24	31	7
Participant 11	6	F	25	35	10
Participant 12	7	M	30	31	1

Note: F=Female. M=Male. Age is reported in years.
Δ = Change between pre- and post-assessments.

CHAPTER V

DISCUSSION

Discussion

This pilot study assessed the effectiveness of an EAA program on social functioning markers of participants with ASD. On the group level, results indicated statistically significant improvements in the social functioning of participants with autism following the participation in the EAA program. This finding is reinforced by other EAA and ASD studies (Anderson & Meints, 2016; Bass et al., 2009; Gabriels et al., 2012; Lanning et al., 2014; Ward et al., 2013) and supports the hypothesis that EAA is an effective therapy alternative for individuals with autism, particularly as it pertains to social functioning.

Insofar as the individual components of the social functioning survey, the highest improvement was seen on the Adaptation to Riding subscale, with results indicating a mean of .84 for this sample. This question pertains to the level of interest the participant had in riding. When the participant shows a greater amount of interest, it allows for a shared frame of reference between the participant and the other persons present at the EAA program. As noted in the literature, a shared frame of reference is key as it lays the foundation for improved social functioning (Mundy, 2009). As Social Information Processing theory would suggest, elevated interest in the shared frame of reference can

result in opportunities to practice social skills and would by extension build a database of appropriate social responses to pull from in future interactions (Ziv et al., 2014).

A similar amount of change (.83) was seen in the Human Relationship indicator, with the average participant starting at the point in which they could only engage in riding when a significant person (i.e., parent/caregiver) was in view. Over the course of the program, participants were able to engage in the riding activities without the need for their secure base (i.e., parent/caregiver) to be present. These findings illustrate that the EAA program provided participants opportunities to become more autonomous in social situations, an important skill to master in terms of social functioning. That is, through EAA, participants seem to learn how be independent in the riding context and may realize that they can be successful in a social setting without the need for their secure base. These improvements can be explained through the lens of Social Information Processing theory, which posits that a new social context (i.e. socializing without caregiver in view) requires the construction of response (i.e. remaining calm and proceeding with the interaction). Each time the individual finds themselves in that social context, they learn to use that constructed response because it is effective and appropriate. Over time, this results in the acclimation to the experience that was at first uncomfortable (i.e. independence in a social setting), and use that constructed response in future similar scenarios (Ziv et al., 2014).

Two areas in which change did not occur or were very limited were the participants' ability to have Control of Emotions (no change) and the amount of Fear and Nervousness (.17). No gains in participants' Control of Emotions was noted, but this is not surprising in that the EAT program is not focused on assisting participants in coping

with negative emotions. Additionally, the Fear and Nervousness had a high mean on the pre-evaluation (4.58/5), indicating that there was not much room for improvement. This finding may stem from the fact that the majority of participants' (92%) had previous experience in EAA and thus were comfortable with the presence of the horse.

Given the wide age range of the sample, additional paired samples *t*-tests were conducted to determine if certain groups (i.e., children; adolescents) of individuals experienced different rates of change than others. These results showed there was no significant differences when participants were grouped by age. This finding is consistent with the results of Gabriels and colleagues (2016) who found no significant differences in improvements among specific age groups. Further, the findings build on a growing literature indicating that EAA may be an appropriate therapy for both children and adolescents (Anderson & Meints, 2016; Bass et al., 2009; Borgi et al., 2016; Gabriels et al., 2012; Lanning et al., 2014; Ward et al., 2013).

To further understand changes in social functioning, an individual analysis of the total social skills score was conducted. The individual analyses showed that of all the participants, the girls showed more improvement than the boys. Indeed, 100% of the female participants improved, while only 63% of male participants improved. These results may be because girls tend to present with higher ASD severity (CDC, 2016), yielding opportunity for greater improvement. Of note, no other study to our knowledge that has examined the effects of EAA on outcomes of participants with ASD has examined the role of gender in their findings.

Limitations

Similar to other studies in the EAA literature, the sample is small and thus these findings are framed as pilot data for understanding the role of EAA on social functioning in persons with ASD. However, social functioning is not a construct that has been a focus of research with this population and intervention type, so our findings build on the scant literature available. The procedures were altered for one participant as he was included in a therapy group that engaged in groundwork prior to riding therapy; groundwork was not a part of the program for the other eleven participants. Information on the ASD severity of each participant was not collected. This information may be important when analyzing results among individuals and groups, as ASD severity may play a role in EAA effectiveness. Dosage (number of therapy sessions the participant attended) may be a factor in level of improvements (i.e. more frequent participation may lead to higher posttest scores). This study only employed one measure of social functioning and this measure was completed only by one CTRI so inter-rater reliability was not conducted. Additionally, some participants were rated by a different CTRI at pre- and post-evaluations, and although the CTRIs were well trained on how to complete the assessment, this could have impacted the results.

Future Directions

Future studies should evaluate the effect of potential confounds (e.g., medication, gender, previous riding experience, ASD severity, procedural differences, dosage) as these may affect the level of improvements in ASD participants following participation in EAA. Additionally, inter-rater reliability and multiple assessments of the same construct are important for future studies to include. Finally, Ward and colleagues (2013)

employed an interrupted EAA treatment design and found that gains were not maintained when treatment stopped but that improvements came back once treatment resumed. Thus, it may be of interest to compare participant's post-evaluation scores at the end of the program with the pre-evaluation scores at the resumption of therapy after treatment interruption (i.e. summer break). This information may be valuable as it would add to the literature on the importance of consistent therapy as well as inform procedures for future program implementation.

The data from this pilot study will inform future research on the Mississippi State University EAT program. Specifically, more demographic data will be obtained, attendance will be documented, and data from consecutive program involvement will be analyzed to longitudinally examine the effects of the program. Additionally, multiple assessments will be used to measure social functioning improvements in riders and these assessments will be conducted by two CTRIs.

Summary and Implications

The findings from this pilot study build on the limited amount of evidence available that supports EAA as an effective therapy for persons with ASD and suggest that future studies consider the potential influence that participation in an EAA program may have on social functioning. If future studies are able to replicate these findings on a larger scale, then EAA could potentially be a prescribed and insurance-approved therapy for children and adolescents with ASD. These data inform current programming, providing an opportunity for improvements in programming and future research.

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