

**Investigating Therapeutic Horseback Riding as Intervention for Autism Spectrum Disorder**

**Hiroko Nishimura**

**University of Maryland College Park**

**Investigating Therapeutic Horseback Riding as Intervention for Autism Spectrum**

## Disorder

### Introduction

According to the newly revised fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V), released in May of 2013, a person diagnosed with Autism Spectrum Disorder (ASD) must have “persistent deficits in social communication and social interaction across multiple contexts,” and must exhibit “restricted, repetitive patterns of behavior, interests, or activities” (Autism Speaks, 2013). However, in the studies conducted before 2013, autism spectrum disorder is defined as a “developmental disorder characterized by deficits in social, communication, and motor skill functioning” (Bass, Duchowny, & Llabre, 2009). The “classic features” of autism in this previous definition include “lack of social awareness and communication, deficits in sensory integration, and an inability to initiate directed attention” (Bass et al., 2009). In the past two decades, prevalence has risen nearly 600%, with current national estimate suggesting that 1 in 88 children have Autism Spectrum Disorder. The United States spends \$137 billion a year on costs associated with the condition, and families spend \$1.2 million to care for an individual with autism across his life (Jenkins & Reed, 2013).

In the recent years, there has been a surge in demands for effective interventions for children with autism, because of the significantly increased prevalence of the condition and the “longstanding tradition and legacy of accepting, condoning, and even promoting methods and strategies that lack efficacy and proven utility” in treating its symptoms. Largely due to the “largely inexplicable” nature of autism spectrum disorder, despite the advancements in treating and understanding the condition, people with autism remain an “enigmatic group.” Large number of “highly controversial” interventions have been developed and promoted for autism, which is perhaps taking a large role in hindering progress for the establishment of effective and

reliable methods of interventions (Simpson, 2005). Researchers identified 414 different interventions for children with ASD. The sheer number of available interventions available makes finding and implementing an effective intervention a challenge for parents and professionals (Jenkins & Reed, 2013).

The search for an effective intervention is often complicated by popular media, where anecdotal cases are highlighted in mediums such as news stories, biographies, and films, easily accessible by consumers, and created to impress (O'Haire, 2013). An example of such publication is an article titled, "Hoof Prints: Equine Therapy for Autistic Children," by Alexandra Dingman, published in, "Encounter: Education for Meaning and Social Justice" (2008). "Encounter" is a "journal of educational research and perspective" (Great Ideas in Education). The article is about using equine therapy for children with autism. In describing her own experience with a seven year old boy with autism named Jonah, the author wrote, "During the last two years, Jonah has gradually become more interested in me; he now seeks me out in the barn when he arrives, makes eye-contact and engages in games with me at the barn" (Dingman, 2008). This statement came after a segment detailing symptoms of autism Jonah exhibits: unfluent with nonverbal cues and social skills, does not make eye contact, has "mumbled and often incoherent" speech, uses "repetitive language and movements," and is "inflexible with routines and schedules" (Dingman, 2008). After just two years, she claimed, he has become a boy who talks to the horses and dogs, makes eye contact, and engages in social games. "For Jonah," she wrote, "riding has been therapeutic." The article cited a study that "showed a slight increase of self-esteem [in children with disabilities] after eight weeks of therapeutic riding," and used some more anecdotal "proofs" such as a quotation from Temple Grandin, a name most parents with children with autism in the United States is probably familiar

with. The author even has a “references” section in the article, where she lists her sources. However, upon close inspection, one finds that most of the “resources” are mainstream publications and multi-media works, such as a video, books (examples: Chicken Soup for the Horse Lover’s Soul and The Red Pony), a parent interview, and websites. She only has one journal article, titled, “Therapeutic horseback riding and self-concept in adolescents with special education needs,” from “Anthrozoos,” whose subjects were not specific to those diagnosed with autism. The author ends the piece with the sentence, “As Kathy Splinter-Watkins put it, ‘I know that therapeutic horseback riding works – just look at the smiles!’” (Dingman, 2008). To parents desperate for answers to their prayers for a “cure,” such statements are no doubt very alluring.

### Animal Assisted Intervention

“Equine Therapy” is another name for “Therapeutic Horseback Riding.” Therapeutic Horseback Riding (THR) is defined as “using horseback riding treatment to improve posture, balance, and mobility while developing a therapeutic bond between the patient and horse” (Bass et al., 2009). It is a subtype of “Animal Assisted Intervention” (AAI), which is the “inclusion of animals in therapeutic activities,” which includes “Animal Assisted Therapy” and “Animal Assisted Activities” (O’Haire, 2013). According to Bass et al. (2009), AAI has been shown to significantly benefit patients’ cognitive, psychological, and social domains, may also lower blood pressure and heart rate, and decrease anxiety. Almost a quarter of the parents with children with autism interviewed in an online survey responded that their children have participated in AAI, and over 60% reported perceived improvements in their children (O’Haire, 2013). The practice of using animals for therapy reportedly began in the late 18<sup>th</sup> century, when animals were brought in to mental institutions to increase social behaviors among the patients. In recent years, autism has become highlighted as a group that may benefit from Animal Assisted

Interventions (O’Haire, 2013).

### Therapeutic Horseback Riding

In 1952, Lis Hartel from Denmark won silver medal for dressage in the Olympics. Her victory was significant due to the fact that she was paralyzed below the knees as a result of contracting polio in the 1940’s, and had utilized horseback riding for rehabilitation. After her win, international attention focused on the potential for therapeutic use of horseback riding for people with disabilities (Gabriels, Agnew, Holt, Shoffner, Zhaoxing, Ruzzano, Clayton, & Mesibov, 2012; Pauw, 2000). In 1969, the “North American Riding for the Handicapped Association” was established to develop “national accreditation standards to ensure safe and effective practices for riding programs and instructors.” Now known as the “Professional Association of Therapeutic Horsemanship International” (PATH International), the association boasts 700 member centers throughout the United States and Canada (Gabriels et al., 2012).

Therapeutic Horseback Riding “stimulates multiple domains of functioning,” and researchers believe that it may be beneficial for children with neurological disorders because the population “frequently present[s] with a combination of motor, cognitive, and social disabilities” (Baas et al., 2009). THR provides two levels of sensorimotor experience. The “lower level,” or “passive interaction,” provides motor challenges for riders to learn how to control their bodies and postures in different positions on the horse’s back, as well as obtain motor control skills and inhibit unnecessary movements. The “higher level,” or “active interaction,” provides various opportunities for the riders to play and interact with others while on horseback, facilitate active movements, and provide opportunities to develop advanced motor skills (Wuang, Wang, Huang, & Su, 2010).

Despite its popularity as a practice, Therapeutic Horseback Riding is considered to be a

set of interventions called “Complementary and Alternative Medicines” (CAM), which includes procedures, interventions, and treatments that are “not considered conventional for a particular treatment need” (Jenkins & Reed, 2013). Because of the lack of empirical evidence supporting THR, organizations such as Association for Science in Autism Treatment and the National Standards Project do not consider the therapy to meet the criteria of Evidence Based Practice (Jenkins & Reed, 2013). However, there has been multiple studies that attempt to “prove” that THR is an effective form of treatment for individuals diagnosed with autism.

### Therapeutic Horseback Riding on Social Functioning

Therapies using animals may improve social interaction, language and communication, reduce the severity of autism and problem behaviors, and positively impact stress and general well-being of individuals with autism (O’Haire, 2013). A study by Baas et al. (2009) looked into effects of therapeutic horseback riding on social functioning in children with autism. They hypothesized that children exposed to therapeutic riding exercises would “exhibit improvements in social functioning” compared to participants who were not given the intervention. To test this hypothesis, the researchers recruited 34 children diagnosed with autism, ages 4 to 10, and placed 19 in the experimental group and 15 in the waitlist control group. They administered 12 weeks of therapeutic riding sessions to the experimental group, for one hour a week. The hour was composed of mounting/dismounting (5 minutes), exercise (at least 10 minutes), riding skills (15 minutes), mounted games (20 minutes), and horsemanship activities (grooming and bathing). Children were verbally and physically reinforced upon completion of each exercise, and effort was made by the adults to maintain eye contact with the children as much as possible. The children’s social behaviors were measured before and after the intervention using the “Social Responsiveness Scale” and the “Sensory Profile.” The experimental group showed improvement

in sensory integration, directed attention, social motivation, and sensory sensitivity, as well as decrease in inattention, distractibility, and sedentariness. Active interaction time with others also significantly increased in the experimental group. These results suggest that THR may be “an efficacious therapeutic option for children with autism spectrum disorder” to improve their social functioning (Baas et al., 2009).

### Therapeutic Horseback Riding on Behavior

Successfully teaching individuals with autism to control inappropriate or problem behaviors is often a vital issue that many people working with them struggle with. Jenkins and Reed (2013) conducted a study with 7 children, ages 6 to 14, where they attempted to evaluate effects of Therapeutic Horseback Riding on behaviors of children with autism spectrum disorder through direct observation and recording techniques. The researchers also utilized pre and post tests, which were conducted through “Child Behavior Checklist” and the “Bruininks-Oseretsky Test of Motor Proficiency, second edition” (Jenkins & Reed, 2013).

Of the 7 children, 4 received treatment, and 3 were placed on the waitlist (the waitlisted children received THR after the study was completed). All children took part in an after-school program where they met weekly, and were observed while they completed academic tasks, art, games, and ate snacks. The children receiving the interventions had THR sessions immediately after the program, and they participated in a weekly, hour long therapy program for 9 weeks. The THR program was accredited by the Professional Association of Therapeutic Horsemanship International (PATH International). The behaviors Jenkins and Reed (2013) tracked were: affect (happy/unhappy), responses to initiations, spontaneous initiations, off-task behavior, compliance, problem behavior, posture, and commands to direct the horse. THR did not produce “clinically significant effects” on participant affect, off-task behavior, problem behavior, compliance, or

language. As a result, the researchers concluded that THR is “not an effective intervention to improve performance on these dependent behaviors,” and that it does not provide therapeutic benefits to participants. Seventy five percent of participants had improved posture after the therapy sessions. Parent interview reports suggested that they felt that THR “may be best conceptualized as a leisure activity, rather than a treatment option for symptoms of ASD” (Jenkins & Reed, 2013).

### Therapeutic Horseback Riding on Self-Regulation, Adaptive Living Skills, and Motor Skills

Self-regulation and adaptive living skills are also very important fields that caretakers and professionals working with individuals with autism must focus on when searching for possible intervention options. Gabriels et al. (2012) designed a study to research the effect of weekly horseback riding on self-regulation, adaptive living skills, and motor skills in children and adolescents with autism. Self-regulation behaviors that were investigated were irritability, lethargy, stereotypic behaviors, and hyperactivity. In the study, 26 children and adolescents (6 to 16 years old) diagnosed with autism were given 10 weekly, hour-long therapeutic horseback riding lessons. There was also a waitlist/control group of 16 children, who had a 10 week waitlist period before receiving THR. The THR lessons were taught in groups of 3 to 4 children, and had a two-part focus: therapeutic and horsemanship. The lesson plans addressed physical, cognitive, psychological, social, and horsemanship skills (Gabriels et al., 2012).

Baseline and post-evaluation were conducted using the “Aberrant Behavior Checklist-Community” (ABC-C), “Short Form of the Bruininks-Oseretsky Test of Motor Proficiency” (BOT-2), the Verbal Praxis and Postural Praxis subscales of the “Sensory Integration and Praxis Test” (SIPT), and the “Vineland Adaptive Behavioral Scales – II Interview Edition” (VABS-II).

During each weekly lesson, parents and legal guardians completed the ABC-C questionnaire to report their children's behavior during the preceding week. Self-regulation measure data was only obtained through the parental ABC-C reports (Gabriels et al., 2012).

The researchers found that there were significant improvements in irritability, lethargy, stereotypic behavior, hyperactivity, motor skills, and verbal praxis/motor planning skills in the experimental group. The children's expressive language and communication behaviors also increased, which the researchers attributed to the sensitive nature of the horses, and the volunteer handlers' encouragements for the children to use verbal commands. The horses would respond immediately to the subtle verbal or physical cues from the children, which may have helped them to become more aware of the impact of their social-communication behaviors. The specific changes from baseline to post-assessments suggest that the improvements in self-regulation, motor skills, and expressive language skills are related to the Therapeutic Horseback Riding treatments the children received (Gabriels et al., 2012).

#### **Therapeutic Horseback Riding on Sensorimotor Deficiencies**

Aside from impairments in social interaction and communication, individuals with autism also have difficulties with sensory integrative and motor functions (Wuang et al., 2010). There have been two types of sensory integrative dysfunction identified in children with autism: disturbances of sensory modulation, and difficulties with sensory discrimination and perception. Problems with sensory modulation result in an inability to "detect, manage, or perceive sensory information," which leads to sensory-avoid behaviors, sensory-seeking behaviors, or fluctuation between the two. Sensory discrimination and perception problems are likely to affect motor planning, emotional-behavioral development, and visual-perceptual functions (Wuang et al., 2010).

Researchers Wuang et al. (2010) looked into non-traditional therapeutic activities, because “traditional therapeutic activities,” generally done in therapy rooms with therapeutic exercises and sensory integration interventions using suspension methods, may become “boring for both children and therapists after a period of time,” and quickly become age inappropriate as the children grow older. They looked into “alternative therapeutic options,” such as aquatic activities, and decided on Therapeutic Horseback Riding as their focus. They were interested in the two levels of sensorimotor benefits THR provides for the riders, and its ability to help children to “develop weight shift and postural control.” The researchers also acknowledged that, despite the therapeutic advantages, THR’s benefits to children with autism “remain elusive.” Therefore, they designed an experiment to create a “Simulated Developmental Horse-Riding Program” (SDHRP) using “Joba,” exercise equipment developed to attempt to simulate movements of horse riding (which allows users to avoid the expense and inconveniences of actual horseback riding therapy) (Wuang et al., 2010).

Using the Simulated Developmental Horse-Riding Program they developed, Wuang et al. (2010) recruited 60 elementary school aged children with autism to examine effectiveness of the program in improving motor and sensory integrative functions. They hypothesized that Therapeutic Horseback Riding is beneficial in “remediation of sensorimotor deficiencies in children with autism.”

The children were split into two groups (Group A and Group B), with 30 children in each group. They were recruited from five elementary schools and three special schools in a metropolitan city, and their ages ranged from 6 to 10. The intervention was 44 weeks long, with 20 weeks of Simulated Developmental Horse-Riding Program, 20 weeks of control period, and 4 weeks of assessments and transitions. The SDHRP sessions were 1 hour long each, 2 sessions a

week, with 40 sessions total for each group (Wuang et al., 2010).

The first and last week of the study were devoted to assessments, which took form of “Bruininks-Oseretsky Test of Motor Proficiency” and “Test of Sensory Integration Function.” Group A began the study with 20 weeks of SDHRP and occupational therapy interventions, while Group B received only occupational therapy interventions during the same period. Occupational therapy sessions focused on fine motor function, sensory integrative function, and activities of daily living. There was a two week transition and assessment period, and then the groups switched their interventions, with Group A receiving 20 weeks of just occupational therapy, and Group B receiving SDHRP on top of the occupational therapy. The two forms of assessments were administered by two pediatric occupational therapists, who were blind to the intervention statuses of the children. The SDHRP sessions were comprised of simple limb and mat exercises (to increase flexibility and motivation), mounted exercises in different positions (to enhance body awareness, sensitivity, and coordination), and games on Joba (to strengthen sensory integrative, cognitive, and affective skills, and to develop interpersonal relations and self-directed behaviors through interactive play) (Wuang et al., 2010).

After the SDHRP intervention, children showed significant improvements in gross motor skills, visuomotor coordination, upper-limb control, and sensory integrative functions. All TSIF scores increased, with significant gains in the emotion and behavior subtest. Their improved ability to control the trunk and shift body weight improved their walking and running abilities. Receiving just occupational therapy also yielded positive results, but the effect sizes for both tests were much larger after the combination of SDHRP and occupational therapy provided together. From the assessment results, the researchers concluded that the “results of this study testify to the positive impact of SDHRP on motor proficiency and sensory integrative functions

in children with autism,” and in particular, that the combination of occupational therapy and SDHRP would maximize the treatment effects. However, they believe that SDHRP alone can provide “improved sensory integrative functions” as result of constant practice of integration of visual, vestibular, and proprioceptive inputs (Wuang et al., 2010).

### Physical Benefits of Therapeutic Horseback Riding

People with autism are considered to be at a higher risk for heart disease, obesity, and diabetes because they are prone to be more sedentary and less active. Having children with autism engage in exercise will help to improve the physical condition as well as aid in reducing maladaptive behavioral patterns. In a meta-analysis of 16 behavioral studies that analyzed the effects of physical exercises and activities on children and adults with autism, all 16 studies concluded that exercise-based interventions reported “positive and promising effects” in yielding positive results in the subjects’ motor and social deficits (Sowa & Meulenbroek, 2012).

One of the major rationales for Horseback Riding Therapy is the belief that a horse’s gait is a simulation of human gait, which provides riders (especially those with ambulatory difficulties) with a “normal sensorimotor experience,” helping to improve coordination, balance, posture, joint mobility, muscle elasticity, and strength (Pauw, 2000). Researchers in Japan attempted to investigate the hypothesis that stimulation received from the horse’s gait resembles stimulation produced by human walking through the use of accelerometry.

They conducted a three-dimensional analysis of horses walking and humans walking to test whether the “movement of the horse’s pelvis during horseback riding resembles human ambulation,” and if so, if the similarity in movement, provides “motor and sensory inputs similar to those received during human walking” (Uchiyama, Ohtani, & Ohta, 2011).

The first part of the study was to analyze and compare ambulation of humans and horses,

using 50 health humans, aged 20 to 24 years, and 11 horses, aged 11 to 24 years. They used four sets of equipment to measure the three-dimensional acceleration of humans and horses walking, with the sensors placed on the participants. The participants walked for 3 minutes, with the data sampling rate set at 50ms. The researchers analyzed the data using the Fast Fourier Transform for frequency of acceleration wave. The data showed that “frequency peaks of horse walking corresponded with those of human walking,” and human acceleration and horse acceleration matched 90%. As a result, researchers concluded that horseback riding “provides motor and sensory inputs through variations in gravity,” and that the “acceleration of the horse while walking was comparable with that of human walking” (Uchiyama et al., 2011).

The second part of the study analyzed the heart rate, breathing rate, and blood pressure of 127 human participants (ages 19 through 22) before activity, after walking, and after horseback riding (at walking gait). The data readings showed that there were “no significant differences in heart rate or breathing rate” between walking and horseback riding, and diastolic blood pressure was lower for both walking and horseback riding when compared to the normal rate. As a result, researchers concluded that horseback riding provides similar effects to the body to walking. Uchiyama et al. (2011) concluded that horseback riding at walking gait provides stimulation “highly similar to that generated by human walking,” and will also help the individuals to achieve “cardiorespiratory fitness and weight control” by providing the same exercise intensity as walking exercises.

## Conclusion

How human-animal interaction through Therapeutic Horseback Riding is helpful to individuals with autism has implications for the quality of life for these individuals (Gabriels et al., 2012). Research has reported benefits in various developmental domains when THR is used

for children with autism, such as improvements in social functioning, self-regulation behaviors, expressive language and motor skills, and in alleviating the severity of symptoms associated with autism, amongst others (Jenkins & Reed, 2013). However, majority of the studies that were analyzed in this paper lacked direct observation and measurement of behavior in obtaining data, and instead, relied on surveys and standardized behavior assessments. Exceptions were Uchiyama et al. (2011) and Jenkins & Reed (2013), both of which utilized direct observation and empirical data collection techniques to derive their conclusions. Uchiyama et al. (2011) found that there are indeed potential for physical benefits to be derived from horseback riding, and Jenkins and Reed (2013) found that THR did not produce systematic changes in majority of the behaviors tracked in the study.

Many studies conducted on using THR as an intervention suffer from discrepancy between statistical and empirical test results and the qualitative results provided by the parents, riders, and health professionals (Pauw, 2000). Too often, anecdotal “successes” are used to sensationally publicize effectiveness of therapies without empirical backings to support the claims (O’Haire, 2013). Gabriels et al. (2012) suggests a need for “clearly defined and empirically supported THR curriculum manual” to inform the 700+ PATH International member centers and other providers working with individuals with autism. Such a measure would help to “sharpen the delivery of THR, allowing THR programs to intervene” in significant and long-term manners (Gabriels et al., 2012). In analyzing problems experienced by researchers in conducting studies on Therapeutic Horseback Riding, Pauw (2000) suggests that researchers should consider involving multiple riding centers over extended periods of time in order to increase the sample size of their data. The researchers should also analyze previously conducted studies in order to obtain insights on what components and strategies were effective and ineffective (Pauw, 2000).

Dr. Temple Grandin, Professor of Animal Science at Colorado State University, observed that animals are “visual-based thinkers,” which is a common learning style of individuals with autism. She suggests that people with autism are not “unsocial,” but rather, relate to other people in ways “more similar to the ways that animals do” (Gabriels et al., 2012). Children with autism spectrum disorder have relatively poor prognoses compared to other groups of children with disabilities, which is attributed to the fact that many are regularly being exposed to interventions that lack efficacy (Simpson, 2005). In an analysis of 33 common interventions for children with autism, there were no interventions identified to be “scientifically based practices” in improving interpersonal relationship, which is one of the areas of development children with autism struggle with, as well as one of the areas THR seeks to impact (Baas et al., 2009; Simpson 2005). Further well-designed research and studies are warranted in order to validate the scientific bases for the effectiveness of the intervention, if Therapeutic Horseback Riding is to be established as an Evidence-Based Practice.

### References

Autism Speaks. (2013). *DSM-5 diagnostic criteria*. Retrieved from

<http://www.autismspeaks.org/what-autism/diagnosis/dsm-5-diagnostic-criteria>

- Bass, M., Duchowny, C., & Llabre, M. (2009). The effect of therapeutic horseback riding on social functioning in children with autism. *Journal of autism and developmental disorders, 39*(9), 1261-1267. doi: 10.1007/s10803-009-0734-3
- Dingman, A. (2008). Hoof prints: Equine therapy for autistic children. *Encounter, 21*(4), 11-13.
- Gabriels, R., Agnew, J., Holt, K., Shoffner, A., Zhaoxing, P., Ruzzano, S., Clayton, G., & Mesibov, G. (2012). Pilot study measuring the effects of therapeutic horseback riding on school-age children and adolescents with autism spectrum disorders. *Research in Autism Spectrum Disorders, 6*(2), 548-588.
- Great Ideas in Education. (n.d.). *Encounter: Education for meaning and social justice*. Retrieved from <http://www.great-ideas.org/enc.htm>
- Jenkins, S., & DiGennaro Reed, F. (2013). An experimental analysis of the effects of therapeutic horseback riding on the behavior of children with autism. *Research in Autism Spectrum Disorders, 7*, 721-740.
- O'Haire, M. (2013). Animal-assisted intervention for autism spectrum disorder: a systematic literature review. *Journal of autism and developmental disorders, 43*(7), 1606-1622. doi: 10.1007/s10803-012-1707-5
- Pauw, J. (2000). Therapeutic horseback riding studies: Problems experienced by researchers. *Physiotherapy, 86*(10), 523-527.
- Simpson, R. (2005). Evidence-based practices and students with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities, 20*(3), 140-149.
- Sowa, M., & Meulenbroek, R. (2012). Effects of physical exercise on autism spectrum disorders: A meta-analysis. *Research in Autism Spectrum Disorders, 6*, 46-57. doi: 10.1016/j.rasd.2011.09.001

Uchiyama, H., Ohtani, N., & Ohta, M. (2011). Three-dimensional analysis of horse and human gaits in therapeutic riding. *Applied Animal Behaviour Science*, *135*(271), 271-276.

Wuang, Y., Wang, C., Huang, M., & Su, C. (2010). The Effectiveness of Simulated Developmental Horse-Riding Program in Children with Autism. *Adapted Physical Activity Quarterly*, *27*(2), 113-126.