

5-1-2023

## The Effects of Therapeutic Horseback Riding on the Balance of a Child with Autism Spectrum Disorder: A Case Study

Liliana De Castro  
*The University of Texas at El Paso*

Follow this and additional works at: [https://scholarworks.utep.edu/dpt\\_cap](https://scholarworks.utep.edu/dpt_cap)



Part of the [Physical Therapy Commons](#)

---

### Recommended Citation

De Castro, Liliana, "The Effects of Therapeutic Horseback Riding on the Balance of a Child with Autism Spectrum Disorder: A Case Study" (2023). *DPT Capstones*. 20.  
[https://scholarworks.utep.edu/dpt\\_cap/20](https://scholarworks.utep.edu/dpt_cap/20)

This DPT Project is brought to you for free and open access by the Physical Therapy and Movement Sciences at ScholarWorks@UTEP. It has been accepted for inclusion in DPT Capstones by an authorized administrator of ScholarWorks@UTEP. For more information, please contact [lweber@utep.edu](mailto:lweber@utep.edu).

**The Effects of Therapeutic Horseback Riding on the Balance of a Child with Autism Spectrum Disorder: A Case Study**

**By**

**Liliana De Castro, SPT**

**Capstone Advisor: Rhonda Manning PT, DPT, PCS**

**Presented to the Faculty of the Doctor of Physical Therapy Program of**

**The University of Texas at El Paso**

**in partial fulfillment of the requirements for the degree of**

**DOCTOR OF PHYSICAL THERAPY**

**THE UNIVERSITY OF TEXAS AT EL PASO**

**MAY 2023**

## Abstract

**Objective:** Therapeutic riding is an emerging tool used by rehabilitation professionals to treat individuals with disabilities. Although recent studies suggest important benefits for this population, the groups represented, and the outcomes studied, in existing literature are limited. Namely, current scholarship focuses on individuals with cerebral palsy, or measures therapeutic outcomes linked to cognitive function in individuals with autism spectrum disorder. The purpose of this case study is to highlight the gross motor benefits that this intervention provided for a child with autism spectrum disorder.

**Methods:** The subject was a 12-year-old boy who was diagnosed with high functioning autism spectrum disorder. The subject was verbal and was able to follow commands. The subject was to undergo a 6-week therapeutic horseback riding intervention where he performed a variety of activities that positioned his body in ways that challenged his somatosensory system. Pre and post scores in his balance were measured using the BOT-2 balance and coordination sections.

**Results:** Following the 6-week intervention, BOT-2 testing demonstrated a clear improvement in all the sections that were considered; most of the improvements noted to be in the bilateral coordination section. Not only were improvements noted in scores from BOT-2 testing, but improvements in performance of these activities were noted as well. By the end of the final session, the subject demonstrated greater ease in going through the session and the various activities.

**Conclusion:** Therapeutic horseback riding demonstrated improvements in both balance in coordination for this subject with autism spectrum disorder. This intervention can be used as a fun, alternate method to classical therapy to improve gross motor function of children with this diagnosis.

**Impact Statement:** Therapeutic riding may provide not just cognitive but also physical benefits for individuals with ASD.

## Background and Purpose

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition that affects about 1% of the worldwide population<sup>1</sup>. It is typically characterized by a set of difficulties in communication and socialization, along with patterns of repetitive behavior<sup>2</sup>. Children on the spectrum have also shown limitations in motor skills, particularly in the areas of balance and coordination<sup>3</sup>. Although an extensive diagnostic criterion for the condition focuses on social interaction, communication, and patterns of behavior,<sup>4</sup> motor difficulties have been mostly ignored until recent years.<sup>5</sup> Emerging evidence suggests that motor difficulties could be one of the earliest, and most accurate, diagnostic tools for ASD.<sup>5</sup>

Therapeutic horseback riding is a type of animal assisted activity used to treat differently abled populations, including people with autism. There are two main types of this therapy: Therapeutic riding (TR) and Hippotherapy (HT). Therapeutic riding is classified as an equine-assisted activity that strives to positively contribute to the “cognitive, physical, emotional and social well-being of individuals with special needs”.<sup>6</sup> The Professional Association of Therapeutic Horsemanship International (PATH Intl.) has documented that the rhythmic movement of horseback riding is comparable to a human gait; a complex

movement that requires a compilation of different variables, including balance. Furthermore, individuals with disabilities who partake in TR activities have shown improvement in muscle control, strength, balance, and flexibility. The American Hippotherapy Association, Inc. (AHTA, Inc.) defines HT as an occupational, physical, or speech therapy treatment tool, which uses equine movement to “engage sensory, neuromotor and cognitive systems to promote functional outcomes.”<sup>7</sup> Although HT certification is highly valued by healthcare professionals, TR is more accessible. For example, certified therapeutic riding instructor (CTRI) certification can be accessed by a wide range of individuals, from special educators to equestrians, and only requires the CTRI to meet coursework and training experience requirements (25 hours).

A recent publication by Wood et al.<sup>8</sup> proposed optimal terminology for services in the United States that incorporate horses to benefit people, in efforts to discontinue problematic terminology. The umbrella term “equine-assisted services” was used to refer to the 12 distinct types of interventions. These were divided into 3 categories: therapy, learning, and horsemanship.<sup>8</sup> Of these categories, TR falls under the horsemanship category whereas HP falls under the therapy category. Although TR and HP remain the leading types of equine-assisted services throughout the literature, other services were mentioned as well. For the purposes of this literature review, TR and HP will be addressed directly as such, whereas other services will simply be referred through the umbrella term “equine-assisted service.”

Despite its potential benefit for individuals with autism, research on the benefit of therapeutic horseback riding is limited in terms of the outcomes measured and the populations investigated. For example, many of the studies that investigate the effects of therapeutic horseback riding on children, or individuals, with ASD investigate its impact on cognitive, or social functioning.<sup>9</sup> For example, Bass<sup>9</sup> finds an overall improvement in sensory integration, social motivation, and directed attention, and a decrease

in distractibility, as a result of applying this therapy. In contrast, studies which outline the potential benefits of therapeutic riding on motor control and motor function, do not tend to measure these benefits in populations with ASD. A systematic review by Stergiou et al.<sup>10</sup> analyzed the effects of TR and HT on individuals with cerebral palsy, multiple sclerosis, stroke, and elderly individuals. The results of this review generally showed significant positive impacts on balance and motor function, amongst other variables, for these individuals.<sup>10</sup>

Temporary improvements in mental well-being, self-efficacy, and self-esteem due to different equine-assisted services have been reported to positively contribute to individuals' overall quality of life.<sup>11, 12, 13</sup> Studies like these have increased the recognition of the value of equine-assisted services in psychiatric rehabilitation.<sup>14</sup> A study by Cerino et al.<sup>14</sup> attributes the alleviation of the negative symptoms that come with schizophrenia to an effective TR program. Borgi et al.<sup>15</sup> highlights improvements in children ASD within the contexts of social functioning, problem-solving, and ameliorated executive activities. Moreover, this study calls attention to promising-although preliminary- positive effects on various motor skills in subjects within this population through TR.<sup>15</sup>

A review of the literature shows that despite a lack of research, the effects of therapeutic riding on the motor function of individuals with ASD is a promising area of investigation. Nuntanee et al.'s<sup>16</sup> study which investigates the effect of elephant-assisted therapy on the balance control of children with ASD, gestures at the possible benefits of TR for this population. Pre-test balance control was measured through postural sway under various conditions, after which participants completed 1.5-hour sessions, twice a week, for a 4-week duration. At post-test, participants showed a significant improvement in their postural sway. Nuntanee et al.<sup>16</sup> concluded that this intervention could facilitate balance control in individuals with ASD. Although this study used somewhat different methodologies, it gestures to the possibility that TR can be used to significantly improve the balance of individuals with ASD.<sup>16</sup>

The purpose of this case study was to investigate the possible improvements in balance in a subject diagnosed with autism spectrum disorder following a 6-week therapeutic riding intervention.

### **Case Description**





The intervention was provided by a certified therapeutic riding instructor (PATH Level I and CHA Level II) who is also currently a physical therapy student at The University of Texas at El Paso. The research subject that was recruited to participate in this intervention was 12-year-old boy with high-functioning autism and with no other medical conditions. The subject was able to follow basic directions and was new to the therapeutic riding world. Pre- and post-intervention data, on the possible changes in balance, was collected using the Bruininks-Oseretsky Test of Motor Proficiency Ed. 2 (BOT-2). A physical therapist was recruited to facilitate this data collection during the week before the intervention and the week following the final session.



Throughout the 6-week period, the subject attended therapeutic riding sessions once a week for one hour. Sessions were provided by the same instructor and the subject completed activities consisted of basic horse-back riding techniques, such as “stop and go” cues, as well as static and dynamic balance activities performed on horseback with eyes opened and progressing to eyes closed. The horses used for the therapeutic riding sessions had previous experience in therapeutic riding and was desensitized to the activities being performed in order to maximize safety concerns.

The activities performed during the intervention period consisted of the subject positioning himself in different ways that challenged his somatosensory system. Table 1 below shows the exercises that were practiced within the 6-week period. The subject would begin by practicing these activities at a full stop before attempting them at a walking gait. The positions were held for at least 5 sets of 10 seconds each before changing to a different position. Once the subject was able to perform the activity

without hesitations, he was encouraged to perform each of these with eyes closed, also performing 5 sets of 5-10 seconds.

**Table 1. Activities performed during the 6-week intervention.**

<p><b>Activity 1</b></p>	<p>The subject was to lie down on the horse and maintain balance without the use of his hands. Activity was performed with eyes opened and eyes closed.</p>	
<p><b>Activity 2</b></p>	<p>Subject was to position himself in kneeling position on the horse with hands out to the side. Activity was performed with eyes opened and eyes closed.</p>	
<p><b>Activity 3</b></p>	<p>The subject was to bring his legs over the horse's neck to perform a 360-degree spin while sitting on the horse. Activity was performed with eyes opened and eyes closed in both clockwise and counterclockwise directions.</p>	
<p><b>Activity 4</b></p>	<p>The subject was to maintain quadruped position on the horse facing forwards. Activity was performed with eyes opened and eyes closed.</p>	

<p><b>Activity 5</b></p>	<p>Once in quadruped position, subject was to extend one leg and hold for 10 seconds.</p> <p>Upper extremity extension was deferred.</p> <p>Activity was only achieved with eyes opened.</p>	
<p><b>Activity 6</b></p>	<p>The subject was to stand on the horse with wide and narrow base of support while in a full stop. Activity was performed with eyes opened and eyes closed.</p>	

**Outcomes**

Following the 6-week intervention, BOT-2 testing demonstrated a clear improvement in all of the sections that were considered; most of the improvements noted to be in the bilateral coordination section. Not only were improvements noted in scores from BOT-2 testing, but improvements in performance of these activities were noted as well. By the end of the final session, the subject demonstrated greater ease in going through the session and the various activities. There was also a notable confidence boost, per subject report.

Table 2 demonstrates that bilateral coordination total point scores improved from 11 to 16 and scale score from 6 to 8. This, translating to an improvement of age equivalent from 4:2-3 to 6:6-8. In terms of balance, total point scores also improved from 24 to 26 and scale score remained at a 7. Changes in age equivalent for this category were noted to go from 4:10-11 to 5:4-5. These numbers are then translated



to improvements in descriptive category, where the subject scored well below age pre-intervention to later score at below age post-intervention.

**Table 2. BOT-2 pre and post intervention scores.**

	Total points	Scale score	Standard score	%tile rank	Age equiv.	Descriptive category
Bilateral coordination						
3/4/2023	11	6			4:2-3	
4/8/2023	16	8			6:6-8	
Balance						
3/4/2023	24	7			4:10-11	
4/8/2023	26	7			5:4-5	
Body Coordination						
3/4/2023			29	2		Well below age
4/8/2023			31	3		Below age

**Discussion**

This area of research involving therapeutic riding as a method of carrying out different interventions provides a new perspective in different areas of focus. This study gives value to the possible motor deficits in individuals with autism, rather than focusing on cognitive aspects that come with this condition. It also provides an innovative method to carry out different therapy interventions, through the use of horses, in order to address these motor deficits within this population. Although this case study has limitations as it cannot define outcomes of an entire population, it can serve as a blueprint for further research that aims to investigate the effects and benefits of therapeutic horsemanship.

## Sources

1. Lai MC, Lombardo MV, Baron-Cohen S. Autism. *Lancet*. 2014 Mar 8;383(9920):896-910.
2. Steiner, H. and Kertesz, Z., 2015. Effects of therapeutic horse riding on gait cycle parameters and some aspects of behavior of children with autism. *Acta Physiologica Hungarica*, 102(3), pp.324-335.
3. Stins, J. and Emck, C., 2018. Balance performance in autism: a brief overview. *Frontiers in Psychology*, 9.
4. Johnson, C. and Myers, S., 2007. Identification and evaluation of children with autism spectrum disorders. *PEDIATRICS*, 120(5), pp.1183-1215.
5. Travers, B., Powell, P., Klinger, L. and Klinger, M., 2012. Motor difficulties in autism spectrum disorder: linking symptom severity and postural stability. *J Autism Dev Disord*, 43(7), pp.1568-1583.
6. Smith, C., 2021. Learn About Therapeutic Riding. PATH Int. Accessed 12 May 2021. Available at: [https://www.pathintl.org/resources-education/resources/eaat/198-learn-about-therapeutic-riding?gclid=CjwKCAjwnPOEBhA0EiwA609ReRvAdPCOfKzPlk1-89ur9R5pwHRqMxE5wigJzuEQa3DVuqaUs3rvTBoCFNcQAvD\\_BwE](https://www.pathintl.org/resources-education/resources/eaat/198-learn-about-therapeutic-riding?gclid=CjwKCAjwnPOEBhA0EiwA609ReRvAdPCOfKzPlk1-89ur9R5pwHRqMxE5wigJzuEQa3DVuqaUs3rvTBoCFNcQAvD_BwE).
7. Peterson, A., 2021. What is Hippotherapy. American Hippotherapy Association. Accessed 12 May 2021. Available at: <https://www.americanhippotherapyassociation.org/what-is-hippotherapy>
8. Wood, W. et al., 2021. Optimal terminology for services in the united states that incorporate horses to benefit people: a consensus document. *JACM*, 27(1), pp.88-95.
9. Bass, M., Duchowny, C. and Llabre, M., 2009. The effect of therapeutic horseback riding on social functioning in children with autism. *J Autism Dev Disord*, 39(9), pp.1261-1267.
10. Stergiou, A., et al., 2017. Therapeutic effects of horseback riding interventions. *Am J Phys Med Rehabil*, 96(10), pp.717-725.
11. Bizub, A. L., Joy, A., & Davidson, L. (2003). "It's like being in another world": demonstrating the benefits of therapeutic horseback riding for individuals with psychiatric disability. *Psychiatric Rehabilitation Journal*, 26(4), 377–384.
12. Lechner, H. E., Kakebeke, T. H., Hegemann, D., & Baumberger, M. (2007). The effect of hippotherapy on spasticity and on mental well-being of persons with spinal cord injury. *Archives of Physical Medicine and Rehabilitation*, 88(10), 1241–1248.
13. Schultz, P. N., Remick-Barlow, G. A., & Robbins, L. (2007). Equine-assisted psychotherapy: A mental health promotion/intervention modality for children who have experienced intra-family violence. *Health and Social Care in the Community*, 15(3), 265–271.
14. Cerino, S., Cirulli, F., Chiarotti, F., & Seripa, S. (2011). Non-conventional psychiatric rehabilitation in schizophrenia using therapeutic riding: The FISE multicentre Pindar project. *Annali dell Istituto Superiore di Sanita*, 47(4), 409–414.
15. Borgi, M., 2015. Effectiveness of a standardized equine-assisted therapy program for children with autism spectrum disorder. *J Autism Dev Disord*, 46(1), pp.1-9.
16. Nuntanee, S. and Daranee, S., 2019. Effect of motorized elephant-assisted therapy program on balance control of children with autism spectrum disorder. *Occupational Therapy International*, 2019, pp.1-10.
17. Srinivasan, S., Cavagnino, D. and Bhat, A., 2018. Effects of equine therapy on individuals with autism spectrum disorder: a systematic review. *J of Autism Dev Disord*, 5(2), pp.156-175.