

The Effectiveness of Therapeutic Horseback Riding in

Children with Autism Spectrum Disorder

Berlyn N. Mendoza

University of California, Irvine

Sue and Bill Gross School of Nursing

### Abstract

**Background:** Autism spectrum disorder (ASD) is diagnosed in early childhood and affects 1 in 68 children in the United States. ASD often creates deficits in social functioning making it difficult for children with ASD to socialize and communicate with others.

**Purpose:** The purpose of this review paper is to examine the effectiveness of therapeutic horseback riding (THR) on communication and social skills in children with ASD.

**Methods:** Articles were selected from the databases CINAHL and PubMed and were published within the last 10 years in the United States and Europe. Search terms included ASD, children, and THR. Studies with samples sizes of ten or less were excluded.

**Results:** Inconsistent results were found for two of the studies that used the Social Responsiveness Scale; one study found statistically significant results for improved social motivation when compared to the control group ( $p = .038$ ) while another study found a significant improvement for social cognition compared to the control group ( $p = 0.05$ ). The remaining outcomes tested amongst the studies were not significant.

**Conclusion:** Current research does not fully support the efficacy of THR on communication and social skills for children with ASD. Therefore nurses do not have enough evidence to recommend this approach to families that have a child with ASD. Future studies should be conducted using larger sample sizes so the ASD population is well represented. With more research, the findings will hopefully serve to facilitate the assimilation of this population into society.

*Keywords:* Autism spectrum disorder; therapeutic horseback riding; children

## The Effectiveness of Therapeutic Horseback Riding in Children with Autism Spectrum Disorder

Autism spectrum disorder (ASD) is a developmental disorder diagnosed in early childhood characterized by deficits in communication and social skills as core symptoms (American Psychiatric Association [APA], 2013). Children may have difficulties using and understanding nonverbal conversation skills such as the use of gestures, eye contact, and facial expressions (National Institute on Deafness and Other Communication Disorders, 2017). Other hallmark traits include social withdrawal, low social motivation to engage in social interactions, and reduced social awareness (APA, 2013).

According to the Centers for Disease Control and Prevention's *Morbidity and Mortality Weekly Report* (2016), approximately 1 in 68 children are identified to have ASD. With this high prevalence, many families are in need of proper guidance to treatments that could benefit their child. Moodie-Dyer, Joyce, Anderson-Butcher, and Hoffman (2014) conducted a qualitative study on the experience of parents and caregivers after their child was diagnosed with ASD. Many felt like there was a lack of information regarding the steps to take after diagnosis and were let down by their health care providers (Moodie-Dyer et al., 2014). Access to resources has the potential to positively influence a child with ASD's development and transition into society (Warren et al., 2011). Therefore, it is important for all providers including nurses to remain up to date on the current evidence for therapeutic management of this disorder. Sharing new information regarding treatment options will empower families and thus maintain patient family satisfaction (Mien Li & Vehviläinen-Julkunen, 2016).

Speech therapy is a frequently referred treatment option for children with ASD. This form of therapy is very effective for improving communication and social skills, however it may

not be enough as some children need additional support to improve these skills. An internet survey revealed that children with autism were enrolled in an average of 4 to 6 different treatments at once (Goin-Kochel, Myers, & Mackintosh, 2006), revealing that one therapy is not enough.

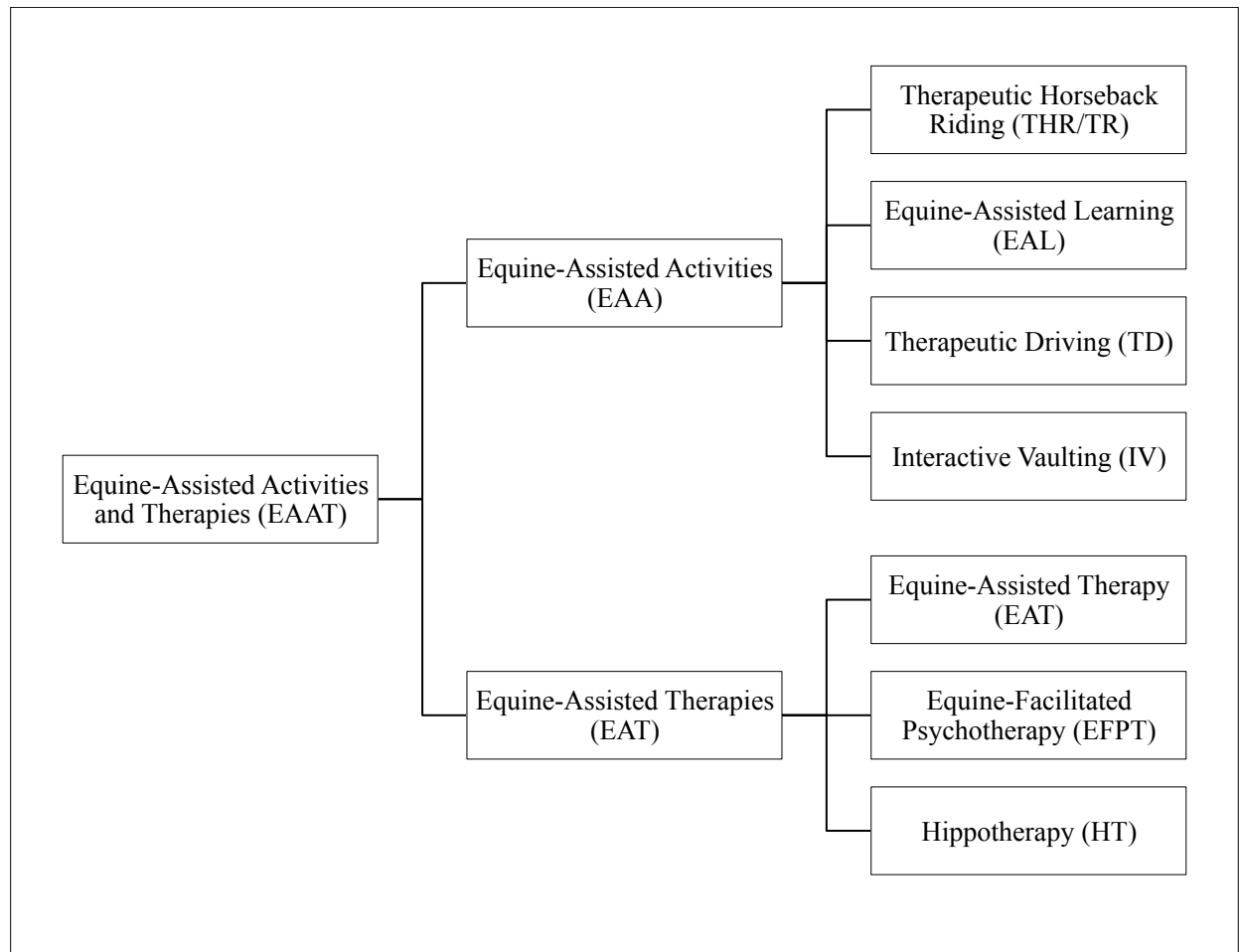
Many have taken strides to look into the efficacy of animal-assisted therapies utilizing horses, dogs, guinea pigs, and even dolphins (O’Haire, 2012). The animals act as a novel stimulus that motivates and stimulates the child’s interest during therapy, enhancing their learning. Animal-assisted therapies typically involve weekly therapy sessions for a set number of weeks, and participants with ASD are randomized into an experimental group with the animal of choice or into a control group with no animal present (O’Haire, 2012). Sessions focus on engaging with the animal and are thought to facilitate the connection from interacting with animals to interacting with humans. Becker, Roger, and Burrows (2017) examined the effect dogs have on prosocial behaviors in children with ASD. They found that there were significantly fewer social skill deficits exhibited in the canine-assisted therapy group than in the control group without the dogs (Becker, Roger, & Burrows, 2017). Kršková, Talarovičová, and Olexová (2010) investigated the influence guinea pigs had on the social behavior of children with ASD and discovered that the animal’s presence increased the frequency of contacts made with acquaintances and positively influenced the quantity and quality of the children’s social behavior.

Although animal-assisted therapies show promising results, current findings are surface-leveled due to limited research for each type of animal employed as this topic is understudied. Further investigation is required amongst all fronts of animal-assisted therapies in order for their credibility to be recognized as a beneficial approach for managing ASD. The aim of this review

is to examine the effectiveness of therapeutic horseback riding on communication and social skills in children with ASD.

### **Methods**

We conducted a literature review of studies testing the effectiveness of therapeutic horseback riding on communication and social skills for children with ASD. We utilized CINAHL and PubMed as the primary databases to search for relevant research articles from academic journals. Publication dates were limited between January 2008 and April 2018, and the articles were written in English and published in the United States or Europe. Search terms included: ‘autism or asd or autism spectrum disorder’ AND ‘children or adolescents or youth or child or teenager’ AND ‘therapeutic horseback riding or therapeutic riding or equine assisted activities’ AND ‘communication or social’ NOT ‘equine psychotherapy or hippotherapy’. Study designs were limited to quasi-experiments and randomized controlled trials. For better accuracy, only studies with a sample size greater than ten children were included. Studies involving any child that did not have an autism diagnosis within the sample were excluded, as well as outcomes that did not include effects on communication or social skills. According to the Professional Association of Therapeutic Horsemanship (PATH) International (2016), therapeutic horseback riding (or therapeutic riding) is a specific form of equine-assisted activities (EAA); thus, any form of therapy that fell outside of this category was excluded (Figure 1). The inclusion criteria and limiters narrowed the search down to 5 articles. The final 3 articles were selected because they used similar instruments to measure outcomes.



*Figure 1.* PATH International (2016) EAAT ladder. This figure illustrates the categorical differences between various Equine-assisted activities and therapies.

## Results

### Intervention Description

Three studies were reviewed to analyze the effect of therapeutic horseback riding (THR) on communication and social skills in children with ASD. Therapeutic horseback riding is a form of animal-assisted therapy, specifically an EAA. For the studies being reviewed, the THR interventions involved approaching the horses, mounting and dismounting, engaging in riding skills, and performing grooming activities (Anderson & Meints, 2016; Bass, Duchowny, & Llabre, 2009; Gabriels et al., 2015). These sessions occurred at riding centers and were taught by trained riding instructors (Anderson & Meints, 2016; Bass et al., 2009; Gabriels et al., 2015).

### **Social Responsiveness Scale**

Bass et al. (2009) and Gabriels et al. (2015) both used the Social Responsiveness Scale (SRS) to measure changes in social functioning. A decrease in score from pre-intervention to post-intervention is considered a desired improvement for ASD symptoms. Bass et al. (2009) and Gabriels et al. (2015) both tested 3 of the same subscales: social motivation, social cognition, and social awareness. Social motivation is the desire to engage in social contact with another individual (Constantino, 2002). Social cognition is expressive social communication (Constantino, 2002). Social awareness is the ability to understand social cues (Constantino, 2002).

**Social motivation.** Bass et al. (2009) found a significant difference between the experimental and control group's post-intervention social motivation score ( $M_{\text{Experimental}} = 12.5 \pm 5.9$  vs.  $M_{\text{Control}} = 16.2 \pm 6.7$ ;  $p = 0.038$ ). For Gabriels et al. (2015) however, the decrease in social motivation was not significant between groups ( $M_{\text{Experimental}} = 11.9 \pm 4.97$  vs.  $M_{\text{Control}} = 13.2 \pm 6.36$ ;  $p = 0.19$ ).

**Social cognition.** Gabriels et al. (2015) found a significant decrease in the social cognition subscale between the experimental and control groups ( $M_{\text{Experimental}} = 17.6 \pm 5.55$  vs.  $M_{\text{Control}} = 19.1 \pm 5.64$ ;  $p = 0.05$ ). These findings were inconsistent compared to the findings of Bass et al. (2009), which were not significant under this subscale between groups ( $M_{\text{Experimental}} = 16.1 \pm 5.8$  vs.  $M_{\text{Control}} = 18.9 \pm 6.6$ ;  $p > 0.05$ ).

**Social awareness.** Bass et al. (2009) did not find a statistically significant decrease in the social awareness subscale between the experimental and control groups ( $M_{\text{Experimental}} = 9.9 \pm 2.7$  vs.  $M_{\text{Control}} = 11.1 \pm 3.2$ ;  $p > 0.05$ ). Similarly, Gabriels et al. (2015) did not find a significant

decrease in this subscale between groups as well ( $M_{\text{Experimental}} = 12.2 \pm 3.14$  vs.  $M_{\text{Control}} = 12.4 \pm 3.36$ ;  $p = 0.54$ ).

Overall, there were inconsistent results regarding the efficacy of THR for social motivation and social cognition, while social awareness showed no significant improvement when compared to the control group for both studies (Bass et al., 2009; Gabriels et al., 2015).

### **Vineland Adaptive Behavior Scale**

Gabriels et al. (2015) and Anderson and Meints (2016) both used the Vineland Adaptive Behavior Scale, Survey Interview Form (VABS) to measure communication and social skills; however, Gabriels et al. (2015) used the second edition (VABS-II), while Anderson and Meints (2016) used the first edition (VABS). These two instruments both measured the same subdomains of adaptive behaviors (communication and socialization raw scores for our purposes), but the range in scores varies between the two instruments for the behaviors being measured. Therefore, the results gathered between the two studies are not comparable based on their score, but rather if they were found to be significant or not. In addition, Gabriels et al. (2015) continued to compare differences between the experimental and control groups to test for intervention significance, while Anderson and Meints (2016) compared differences between pre- and post-intervention data, as their study was a quasi-experiment with no control group.

Improvements to the communication raw score were not significant for both Gabriels et al. (2015) ( $M_{\text{Experimental}} = 140.9 \pm 36.93$  vs.  $M_{\text{Control}} = 139.6 \pm 31.87$ ;  $p = 0.97$ ) and Anderson and Meints (2016) (pre-intervention:  $M = 44.20 \pm 31.19$  vs. post-intervention:  $M = 44.60 \pm 30.39$ ;  $p = 0.442$ ). The socialization raw score was also not significant for Gabriels et al. (2015) ( $M_{\text{Experimental}} = 107.0 \pm 37.60$  vs.  $M_{\text{Control}} = 108.8 \pm 30.78$ ;  $p = 0.44$ ) and Anderson and Meints (2016) (pre-intervention:  $M = 45.27 \pm 23.21$  vs. post-intervention:  $M = 45.07 \pm 22.48$ ;  $p =$



0.582). Thus, THR did not produce a significant difference to either of the subdomains the VABS measured (Anderson & Meints, 2016; Gabriels et al., 2015).

### **Discussion**

The studies selected were designed to test the merits behind therapeutic horseback riding for children with ASD and identify the intervention's effects on communication and social skills. The results were inconsistent regarding improved social motivation and social cognition, while the remaining outcomes tested were not significant. The remainder of this section will analyze the three studies used in order to justify their level of validity for these results.

### **Study Design**

Bass et al. (2009) and Gabriels et al. (2015) conducted randomized-controlled experiments (level II evidence) and Anderson and Meints (2016) used a quasi-experimental design with no control group (level III evidence). According to Ackley, Swan, Ladwig, and Tucker (2008), randomized controlled trials offer the highest quality of evidence for subject level data, increasing the validity of their results.

Between the three studies, Gabriels et al. (2015) and Anderson and Meints (2016) did not have a control group that received no intervention of any kind, as opposed to the waitlist control group Bass et al. (2009) employed. Gabriels et al. (2015) did have a control group, but a placebo group could have created a sounder comparison for the children's baseline. Anderson and Meints (2016) addressed lack of control group and expressed it was due to monetary constraints. Anderson and Meints (2016) also pointed out there was a limited population to gather participants from, contributing to their small sample size.

### **Generalization**

All three studies required an ASD diagnosis, and participants were excluded if they had more than zero to two hours of EAAT within a specified timeframe. Generalizing the results to different regions is difficult to ascertain since subjects were selected from within a particular geographic area in each study. Cultural factors could confound results if this intervention is replicated in different areas, specifically outside of the United States or the United Kingdom where the studies were conducted. Otherwise, if the intervention is repeated in the United States, the results from Bass et al. (2009) and Gabriels et al. (2015) could be generalized to the population within the age ranges tested: participants were randomly selected from regions in the United States, Gabriels et al. (2015) used a power analysis to ensure an adequate sample size to keep the sample representative of the population, and they used the SRS, which has high internal consistency ( $\alpha = 0.97$ ). When tested for internal consistency for each treatment scale, the SRS yielded high Cronbach alpha scores, with social communication being the highest ( $\alpha = 0.92$ ) (Constantino, 2002). These factors all contribute to the two studies' validity. Anderson and Meints' (2016) results have reduced validity due to their small sample size ( $N = 15$ ), quasi-experimental design (level III evidence), and lack of conducted power analysis.

### **Feasibility**

In order for THR to occur, there must be access to a riding center and staff or volunteers trained to work with kids with disabilities to maintain safety and ensure the treatment is effective. Once these two factors are met, this intervention could be implemented anywhere that has a population in need of such an intervention as long as the location is weather and terrain permitting.

Though few, participants who discontinued involvement in the studies reflect potential limitations of this intervention. Bass et al. (2009) believed some participants dropped out of the

study due to lack of incentive to attend the weekly sessions, as the riding center was in a rural area. This limitation could be a recurring issue for future studies and implementation, as riding centers tend to be in remote locations. Therefore, families will only pursue this option if it offers a promising chance for improvement to their child's symptoms.

### **Implications**

The three studies this review has examined produced inconsistent findings regarding the efficacy of therapeutic horseback riding for children with ASD. Bass et al. (2009) only found statistically significant results for improved social motivation, while Gabriels et al. (2015) conversely found statistically significant results for improved social cognition. Both Gabriels et al. (2015) and Anderson and Meints (2016) found results that were not significant for improved communication and socialization raw scores. Thus, these findings do not fully support the efficacy of THR on communication and social skills for children with ASD. However, future research needs to be conducted to clear up these discrepancies and determine if the statistically significant results were confined to their respective studies or if they will recur in replicated future studies.

Once consistent findings are produced, nurses and other health care providers will have evidence to recommend THR to families with a child with ASD that needs improved communication and social skills, or conversely not recommend this approach if the findings are not significant. Consistent findings will ultimately prove if THR is a reputable approach for improving communication and social skills in children with ASD who have this deficit. Fortunately, THR can be adapted in any area that has terrain suitable for horseback riding. Riding centers are established throughout the U.S. and would only need certified staff trained in

working with children with disabilities for the program to ensue. With more evidence backing this intervention, parents may be willing to pursue this option even if the riding center is remote.

### **Future Research**

As recommended above, future research will determine how effective THR is for children with ASD. Of the three studies chosen for this review, the results from the studies conducted by Bass et al. (2009) and Anderson and Meints (2016) had limited application to the ASD population since their sample sizes were limited to 34 and 15 children, respectively. Future studies with the resources available to recruit a larger sample size will produce more representative data, reflective of the pediatric ASD population. Additionally, as discussed by Anderson and Meints (2016), a study with a control group participating in an alternative therapy would provide a more accurate comparison to identify the efficacy of the THR group.

### **Conclusion**

We are unable to support the efficacy behind THR on communication and social skills for children with ASD due to inconsistent results gathered from the three studies used for this review. Significant results varied between two of the studies analyzed with social motivation and social cognition being the only two subscales showing improvements. As a result, this intervention does not have enough evidence behind it for nurses to recommend it as a resource to families in need of new therapies. Nevertheless, the authors reviewed have made a head start in exploring new ways to reduce maladaptive symptoms in children with ASD. With this research, there is hope for future studies to expand upon this foundation and prove if THR is an efficacious alternative to traditional therapies. Ultimately, this type of research can produce groundbreaking discoveries that could drastically improve the quality of life for children with ASD and facilitate their assimilation into society.

## References

- Ackley, B. J., Swan, B. A., Ladwig, G., & Tucker, S. (2008). *Evidence-based nursing care guidelines: Medical-surgical interventions*. (p. 7). St. Louis, MO: Mosby Elsevier.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Anderson, S., & Meints, K. (2016). Brief Report: The Effects of Equine-Assisted Activities on the Social Functioning in Children and Adolescents with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*, 46(10), 3344-3352. doi:10.1007/s10803-016-2869-3
- Bass, M. M., Duchowny, C. A., & Llabre, M. 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
- Becker, J. L., Rogers, E. C., & Burrows, B. (2017). Animal-assisted Social Skills Training for Children with Autism Spectrum Disorders. *Anthrozoos*, 30(2), 307-326. doi:10.1080/08927936.2017.1311055
- Christensen, D. L., Baio, J., Braun, K. V., Bilder, D., Charles, J., Constantino, J. N., . . . Yeargin-Allsopp, M. (2016). Prevalence and Characteristics of Autism Spectrum Disorder Among Children Aged 8 Years — Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2012. *Morbidity and Mortality Weekly Report*, 65(3), 1-23. doi:10.15585/mmwr.ss6503a1
- Constantino, J. N. (2002). *The Social responsiveness scale*. Los Angeles: Western Psychological Services.

- Gabriels, R. L., Pan, Z., Dechant, B., Agnew, J. A., Brim, N., & Mesibov, G. (2015). Randomized Controlled Trial of Therapeutic Horseback Riding in Children and Adolescents With Autism Spectrum Disorder. *Journal of the American Academy of Child & Adolescent Psychiatry, 54*(7), 541-549. doi:10.1016/j.jaac.2015.04.007
- Goin-Kochel, R. P., Myers, B. J., & Mackintosh, V. H. (2007). Parental reports on the use of treatments and therapies for children with autism spectrum disorders. *Research in Autism Spectrum Disorders, 1*(3), 195-209. doi:10.1016/j.rasd.2006.08.006
- Kršková, L., Talarovičová, A., & Olexová, L. (2010). Guinea pigs—The "Small Great" Therapist for Autistic Children, or: Do Guinea Pigs Have Positive Effects on Autistic Child Social Behavior?. *Society & Animals, 18*(2), 139-151. doi:10.1163/156853010X491999
- Mien Li, G., & Vehviläinen-Julkunen, K. (2016). Hospitalised Patients' Satisfaction with Their Nursing Care: An Integrative Review. *Singapore Nursing Journal, 43*(2), 11-27.
- Moodie-Dyer, A., Joyce, H. D., Anderson-Butcher, D., & Hoffman, J. (2014). Parent–Caregiver Experiences With the Autism Spectrum Disorder Service Delivery System. *Journal of Family Social Work, 17*(4), 344-362. doi:10.1080/10522158.2014.903581
- National Institute on Deafness and Other Communication Disorders. (2017). Autism Spectrum Disorder: Communication Problems in Children. Retrieved March 06, 2018, from <https://www.nidcd.nih.gov/health/autism-spectrum-disorder-communication-problems-children>
- O’Haire, M. E. (2012). 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

PATH International. (2016). EAAT Definitions. Retrieved April 10, 2018, from

<https://www.pathintl.org/resources-education/faculty/27-resources/general/193-eaat-definitions>

Warren, Z., Mcpheeters, M. L., Sathe, N., Foss-Feig, J. H., Glasser, A., & Veenstra-

Vanderweele, J. (2011). A Systematic Review of Early Intensive Intervention for Autism Spectrum Disorders. *Pediatrics*, *127*(5), 1303-1311. doi:10.1542/peds.2011-0426