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**Does Animal Assisted Therapy (AAT) positively increase socialization skills in children diagnosed with Autism Spectrum Disorder (ASD) compared to no interaction with animals?**

Tracey Smith, PA-S

A SELECTIVE EVIDENCE BASED MEDICINE REVIEW

In Partial Fulfillment of the Requirements For

The Degree of Master of Science

In

Health Sciences – Physician Assistant

Department of Physician Assistant Studies  
Philadelphia College of Osteopathic Medicine  
Philadelphia, Pennsylvania

December 15, 2017

## Abstract

**Objective-** The objective of this selective EBM review is to determine whether or not “Animal Assisted Therapy (AAT) positively increases socialization skills in children diagnosed with Autism Spectrum Disorder (ASD) compared to no interaction with animals?”

**Study Design-** Systematic review of three randomized controlled trials (RCTs) published in English language peer reviewed journals between 2015 and 2016.

**Data sources-** One single blinded RCT and two double blinded RCTs were found through PubMed.

**Outcome(s) Measured-** All three studies measured change in social communication in children with ASD using a Social Responsiveness Scale, Pedagogical Analysis and Curriculum Test, and Vineland Adaptive Behavior Scale.

**Results-** All three RCTs support how AAT positively improves socialization in children with ASD. Gabriels et al. with a p-value of 0.003 was able to support a significant improvement in social communication skills in children with ASD participating in AAT compared to children with ASD not receiving AAT using t-score and chi square analyses as well as change in mean from baseline, SD, and effect size. Borgi et al. with a p-value of 0.034 supported increased socialization in children with ASD compared to a control group using ANOVA F-score analysis and change from baseline mean scores. Steiner and Kertesz with a p-value<0.000 did support an increase in socialization in children with ASD participating in AAT compared to a control group. However, only a PAC score was recorded and no further analyses were discussed, so the study is not reliable.

**Conclusions-** AAT seems to be an effective therapy to positively change socialization skills in children with ASD based on these three RCTs. However, more reliable studies including larger sample sizes over longer periods of time with more detailed analyses should be performed to support the long term effects of AAT on socialization specifically in children with ASD.

**Key Words-** Animal Assisted Therapy, Autism Spectrum Disorder, Equine Therapy

## Introduction

Autism Spectrum Disorder (ASD) is a disorder relating to a wide array of developmental disabilities, such as lack of social skills, repetitive or obsessive behaviors, and issues regarding verbal and non-verbal communication.<sup>1</sup> According to the CDC, ASD is considered an umbrella term for different diagnoses including autism disorder, pervasive developmental disorder not otherwise specified, and Asperger Syndrome.<sup>2</sup> ASD can usually be detected and diagnosed by age two at the earliest with symptoms varying from avoiding eye contact with others and not wanting any physical contact to repeating actions constantly and not liking change in routines.<sup>1, 2</sup> Due to a lack of social skills, people with ASD struggle to perceive others' emotions or even convey their own emotions which can become stressful.<sup>2</sup> However, there are different therapies and treatments for those with ASD to help enhance socialization. This paper analyzes three randomized controlled trials (RCTs) that compare therapeutic animal assisted therapy (AAT) to no interaction with animals and their effects on socialization in children diagnosed with ASD.

With an estimated 1 in 68 children diagnosed each year in the United States with ASD, and with that prevalence growing each year, discussing and finding different effective therapies such as AAT to help children with ASD better interact with peers is crucial to the PA scope of practice and will only help patients thrive.<sup>2</sup> Autismspeaks.org also mentions how about 1/3 of children with ASD are non-verbal, so reviewing and studying effects of AAT can help health practitioners know how to better care for their patients.<sup>1</sup> Focusing on helping these patients better interact with others is also important because such a high prevalence of diagnoses means higher medical costs annually. The CDC states that in 2011, the total expenditure for children with ASD in the U.S. was an estimated \$11.5 billion-\$60.9 billion.<sup>2</sup> That does not include intensive behavioral therapies which has been estimated to cost between \$40,000-

\$60,000/child/year.<sup>2</sup> This translates to children with ASD having medical expenditures that are 4.1-6.2 times greater than children that do not have ASD.<sup>2</sup> Medical expenditures like these require attention and reviews. Another reason this topic is relevant is the high rate of healthcare visits annually. A 2006 study in *Pediatrics* stated that between 2003 and 2004, children with ASD in the U.S. had a higher total annual mean number of outpatient visits (5.6 vs. 2.8) and hospitalizations (5% vs. 2%) compared to children without ASD.<sup>3</sup>

Even with estimations of high medical expenditures and a greater number of healthcare visits, there is still little research on known causes of ASD. It is believed, though, that genetics are the biggest factor, but there have been no specific genes identified as direct correlations to ASD yet.<sup>2</sup> Some studies according to the CDC have supported that certain biologic and environmental factors also contribute to ASD, such as advanced maternal age, drugs taken during pregnancy, or chromosomal conditions like Fragile X Syndrome.<sup>2</sup> Besides certain signs and symptoms at a young age like difficulties comprehending feelings or emotions or not responding to their name by 12 months old, there are no other tests available to pinpoint what causes ASD in children.<sup>2</sup> Many unknowns also makes a cure impossible at this point, but there are numerous methods to help children with ASD live better and less stressful lives. Some treatment options include applied behavioral therapy, speech therapy, occupational therapy, or sensory integration therapy.<sup>2</sup> There are also early intervention services such as psychotherapists and aides in school under the Individuals with Disabilities Education Act (IDEA).<sup>2</sup> Some medications are also prescribed, such as antipsychotics for behavioral issues, antidepressants for anxiety, or Ritalin for inability to focus.<sup>2</sup> While there is no one definitive treatment for ASD, each one mentioned can in their own way improve behavior and social skills in children. AAT is one treatment in particular becoming more well-known. There are not many studies on AAT,

but some do suggest there is a positive effect on social skills in children with ASD compared to no interaction with animals.<sup>4,5</sup> This is because AAT allows the children to interact with animals, such as horses, care for them, and train on horseback at an attempt to learn responsibility and improve social skills in a more natural setting.<sup>5</sup>

## **Objective**

The objective of this selective EBM review is to determine whether or not “Animal Assisted Therapy (AAT) positively increases socialization skills in children diagnosed with Autism Spectrum Disorder (ASD) compared to no interaction with animals?”

## **Methods**

This selective EBM review focuses on one single blinded randomized controlled trial (RCT) and two double blinded RCTs. In order to discuss the objective using these studies, certain criteria had to be met. First, studies had to include children under 18 years of age who were previously diagnosed with ASD. The interventions included in each study had to be some form of AAT such as Equine Assisted Therapy (EAT). Comparisons to this intervention included children with ASD with no animal contact. The outcomes included were measured changes in social skills and communication with peers before and after AAT. All of the articles were published in peer reviewed journals in the English language. The study conducted by Steiner, Kertesz was first published in the Hungarian language and translated to English. Keywords used to find data sources were Animal Assisted Therapy, Autism Spectrum Disorder, and Equine Therapy. I researched all of these articles through the database PubMed, and they were selected based on recent relevance to question topics and similar patient oriented outcomes (POEMs). Inclusion criteria that had to be met for the EBM review were the studies must be

RCTs, they were published in 2007 or later, and they must have POEM related outcomes.

Exclusion criteria for selection of studies were any Cochrane systematic reviews, meta-analyses, and subjects over 18 years old. The inclusion and exclusion criteria used in each study that will be reviewed as well as other demographics are included in Table 1. The statistics reported in all three RCTs include p-values, change in mean, SD, ANOVA F-score, and effect size.

**Table 1. Demographics and Characteristics of Included Studies**

Study	Type	# of pts	Age in yrs.	Inclusion Criteria	Exclusion Criteria	W/D	Interventions
<b>Gabriels RL (2015)</b>	Single Blinded RCT	127	6-16	Kids aged 6-16 years meeting clinical standards for ASD on the Autism Diagnostic Observation Schedule (ADOS); A combined score on the Irritability and Stereotypy subscales of the Aberrant Behavior Checklist-Community (ABC-C) of $\geq 11$ ; A Leiter-R Brief nonverbal IQ (NVIQ) standard score of $\geq 40$	Identified genetic disorder known to result in phenotype similar to ASD; History of medical or behavioral issues that can make participation dangerous; History of animal abuse or horse phobias; More than 2 hours of equine assisted therapies and activities in the last 6 months; Weight exceeding rider center's policies	11	Minimum of 45 minute therapeutic horseback riding/horse caring sessions for 10 weeks vs. 45 minute sessions learning about horses with no horse interaction for 10 weeks
<b>Steiner H (2015)</b>	Double Blinded RCT	26	10-13	Kids aged 10-13 years diagnosed with ASD enrolled in same special needs school	No exclusion criteria mentioned	0	30 minutes/week therapeutic horseback riding

							sessions for one month vs. no horse contact
<b>Borgi M (2016)</b>	Double blinded RCT	28	6-12	Males aged 6-12 years with diagnosis of ASD and verbal IQ >70 on the Wechsler Intelligence Scale III for Children; No previous therapeutic riding experiences; Informed consent from parents; Child's assent to participate	Serious motor/neurological issues; Allergies; Fearful response towards horses	0	25 60 minute equine assisted therapy Further over six months vs. Not attending equine assisted therapy

## Outcomes Measured

In all three RCTs, change in social communication in children with ASD is measured. Gabriels et al. measured socialization with the Social Responsiveness Scale (SRS) which was a 65 item questionnaire completed by the subjects' caregivers.<sup>4</sup> Data was collected based on caregivers' responses to questions on the subjects' socialization before and after the study was completed.<sup>4</sup> Steiner, Kertesz measured socialization with a Pedagogical Analysis and Curriculum test (PAC) which used a point system and was divided into four sub categories, one category being socialization.<sup>5</sup> One point was awarded based upon certain tasks, and then points were added up to calculate a socialization score.<sup>5</sup> The PAC test was completed before therapy, one month after initiating therapy, after a three month break, and one month after therapy ended altogether.<sup>5</sup> Borgi et al. measured change in social communication using the Vineland Adaptive Behavior Scale (VABS) which collected data and scaled scores from four sub categories (one



being social communication) based on responses from parents/guardians during interviews.<sup>6</sup> These interviews were conducted at least 30 days prior to and 30 days after therapy.<sup>6</sup>

## Results

Gabriels et al. conducted one 10 week study with 127 participants between the ages of six and 16 randomly split into a Therapeutic Horse Riding (THR) experimental group and a no animal contact/barn art project control group.<sup>4</sup> An initial pilot study was conducted in 2012 by the same authors, but this EBM review focuses on this 2015 published study.<sup>4</sup> All 127 subjects were previously diagnosed with ASD without any other genetic disorder for both the experimental and control groups to maintain consistency in calculating social skills (see Table 1).<sup>4</sup> The setting was a certified horse riding facility with subjects who could tolerate animals.<sup>4</sup> Before the conclusion of the study, four subjects in the THR group and seven subjects in the control group were lost to follow up.<sup>4</sup> There was no report of safety within this study, but there was mention that subjects were required to have signed physician medical clearance forms, and all were given lessons with volunteers and at least one PATH certified therapeutic rider instructor and “one master’s level therapist.”<sup>4</sup> One month prior to the study and one month after the study, questionnaires were performed by blinded raters and non-blinded caregivers rating different changes including socialization, communication, self-regulation, and motor behaviors.<sup>4</sup> This study focuses on social communication results. Intent to treat was performed and revealed a p-value of 0.003, so the measurement is reliable and more precise with the p-value<0.05 and an effect size of 0.63 for social communication.<sup>4</sup> This large of an effect size means there is a great difference between THR and control group SDs, meaning children in the THR group improved their social skills at a more significant increased rate than the control group (Table 2).

**Table 2. Gabriels et al. THR group p-value and effect size<sup>4</sup>**

<b>p-value</b>	<b>ES</b>
0.003	0.63

To further show difference in social communication measurements, Gabriels et al. added a change in mean from baseline score for each group and calculated change in SDs (Table 3). Change in baseline mean and SD for the THR group was 6.6 and 1.29 respectively, and change in baseline mean and SD for the control group was 0.3 and -2.54 respectively.<sup>4</sup> The THR group with the larger change in baseline mean had a significantly larger change in socialization before and after therapy compared to the control group. The SD for the THR group was closer to the mean compared to the control group data, meaning the THR group data was more reliable and had less variance. No NNT, NNH, or data on those who dropped during the study were recorded in this study, and continuous data could not be converted.

**Table 3. Treatment Effect of AAT for the Experimental and Control Groups<sup>4</sup>**

	<b>THR group</b>	<b>Control group</b>
<b>Change in Baseline mean</b>	6.6	0.3
<b>SD change</b>	1.29	-2.54

Steiner, Kertesz conducted one five month study in a natural outdoor setting involving two different AAT sessions three months apart.<sup>5</sup> The study consisted of 26 children diagnosed with ASD between the ages of 10-13 years old with 13 subjects in the experimental horse riding group and 13 in the control non-riding group.<sup>5</sup> See Table 1 for exclusion and inclusion criteria. All 26 children were included in the data without any dropped.<sup>5</sup> Data was recorded by Steiner, Kertesz

as horse riding vs. non riding/physical therapy groups.<sup>5</sup> They displayed data on communication from the PAC test immediately before therapy and one month after therapy, and there was no reported difference in compliance between the groups.<sup>5</sup> There was also no reported safety measures, NNT, or NNH associated with the study besides the mention of using the same autistic therapy trained horse and the same therapist and two assistants for the children during AAT throughout the study.<sup>5</sup> To measure treatment effect, Steiner, Kertesz mention a p-value of <0.000, meaning the data has strong reliability, and mean change in baseline of communication PAC scores (Table 4).<sup>5</sup> The change in baseline mean for the experimental AAT group was 5 and the control group had a change of 0 after the full five months and both AAT sessions.<sup>5</sup> With the larger change in mean from baseline in the horse riding group compared to no change whatsoever in the control group, the AAT group had a larger increase in socialization.

**Table 4. Treatment Effect and p-value for groups in Steiner, Kertesz Study<sup>5</sup>**

	<b>p-value</b>	<b>PAC communication score before therapy</b>	<b>PAC communication score one month after therapy</b>	<b>Change in baseline mean</b>
<b>Experimental AAT group</b>	<0.000	4	9	5
<b>Control Group</b>	<0.000	4.25	4.25	0

Borgi et al. conducted one study over a six month period consisting of 25 individual AAT riding sessions at four Italian Equine Federation accredited barns.<sup>6</sup> The study consisted of 28 male children between the ages of 6-12 years old who were previously diagnosed with ASD and are verbal.<sup>6</sup> See Table 1 for inclusion and exclusion criteria. No subject was dropped from the study, but two children were eliminated in analysis of the VABS socialization score due to no baseline interviews.<sup>6</sup> Data analysis was broken down into AAT vs. no animal contact, and there

was a difference in baseline VABS scores for socialization, with the experimental AAT group having a lower baseline socialization score compared to the control group.<sup>6</sup> No safety data, NNT, or NNH were reported in this study, however, 20 therapy trained horses, a physician, and trained Italian Equine Federation instructors were present for each session.<sup>6</sup> Treatment effect data included a reliable correlation p-value of 0.034, ANOVA F-score, and change in baseline mean for socialization with baseline being 30 days prior to treatment (Table 5).<sup>6</sup>

**Table 5. P-values and Treatment Effect Scores for Groups in Borgi et al. Study<sup>6</sup>**

	<b>p-value</b>	<b>ANOVA F-score</b>	<b>Change in baseline mean <math>\pm</math> SE</b>
<b>Experimental Group</b>	0.034	5.30	0.72 $\pm$ 0.22
<b>Control Group</b>	0.034	5.30	0.23 $\pm$ 0.21

The ANOVA F-score for the VABS socialization was 5.30 which is greater than 0, indicating significant reliability in the experimental group data along with the p-value.<sup>6</sup> The change in baseline mean was 0.72 for the AAT group and 0.23 for the control group.<sup>6</sup> The larger change in mean for the AAT group compared to the non-riding group results in a larger increased change in socialization VABS scores for children who partook in AAT.

## **Discussion**

AAT is an up and coming studied therapy in the U.S. to help people with numerous disabilities, such as ASD, Down Syndrome, and neuromuscular defects. Gabriels et al. mentions that since 2009, there has been an increase in studies about AAT and how it effects children as well as adults with ASD.<sup>4</sup> AAT has been the therapy of choice in many European countries for years now for behavioral impairments in children and is being extensively studied as the most

effective treatment for social skills and mobility.<sup>5</sup> However, the mention of animal therapy and the use of animals for psychosocial relations has been recorded since the 1700's.<sup>7</sup> Such recordings of AAT include the stress level reduction and increase in social bonds adults and children have had with animals in the military, during war, and in psychiatric institutions.<sup>7</sup> Another positive aspect of AAT is that there are no recorded contraindications for it as long as people are comfortable around animals. Information about insurance coverage for equine therapy does not exist presently, but service dog programs costs can be partially covered with certain insurances.<sup>8</sup> One Professional Association of Therapeutic Horsemanship International (PATH) site has costs between \$65-\$150/ hour/session for EAT.<sup>8</sup> With ASD in particular, there are different behavioral aspects to take into account, but AAT can be effective in helping children communicate after reviewing these three RCTs.

When searching for studies for this EBM review, there was a limitation in restricted number of RCT studies about AAT affecting social skills in children with ASD in particular. With this limitation, this meant less available reliable studies. While Steiner, Kertesz supported how AAT improves socialization in children with ASD compared to the control group, there is insufficient statistics to firmly support use of this study to justify that AAT for children with ASD positively improves socialization. More intent to treat data besides the p-value and a bar graph with change in baseline mean should be included to further support reliability that children in the AAT group had more significant positive change in socialization compared to children who had no AAT. Individual PAC scores or data lost to follow up were not even included. Another limitation was Gabriels et al. and Borgi et al. relied on parental/caregiver answers to questions, so interviews recording data on social skills could be seen as less reliable than if someone who does not know the children observed their changes directly during AAT.<sup>4,6</sup> All of

the studies in this EBM review also had no mention of sufficiently long follow up data or long enough studies to research long term effects of AAT on socialization.

## **Conclusion**

After conducting this EBM review, there is support that AAT is an effective treatment method for increasing socialization in children diagnosed with ASD. Two of the three RCTs had statistics supporting significant reliability of increased social skills in children with ASD participating in AAT compared to no AAT. Steiner, Kertesz did conclude that AAT is effective in increasing social skills in children with ASD, but did not report any reliable statistics to include it in supporting this review's hypothesis. With two of the three studies also being performed in Europe and one in the U.S. more future RCTs should be performed in the U.S. to show how effective AAT is in particular to children with ASD in this country and culture. Future research is warranted to also include larger populations including wider age ranges of males and females 18 years old and younger with ASD over longer time periods than what was addressed in these studies to more accurately reveal AAT's broad effectiveness. Inclusion criteria for the future should also mention similarity of baseline verbal skills to have more even groups. Further studies should continue to include impartial measurements of socialization before and after AAT like these RCTs used, but they should remain double blinded with third party members such as therapists answering the questionnaires and reviewing changes in the children's social skills. More research is advised at this time to fully reveal the potential of animal therapy for children with developmental disabilities like ASD.

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