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Lost in a Lost World

William Benda, MD

William Benda, MD, is a graduate senior fellow, Program in Integrative Medicine, University of Arizona, Tucson. (*Altern Ther Health Med*. 2011;17(3):8-9.)

Within the covers of this issue of *Alternative Therapies in Health and Medicine* resides a seminal paper, innovative in both the treatment protocol and the participants treated. In "Prospective Trial of Equine-assisted Activities in Autism Spectrum Disorder," Kern et al explore the effects of bonding and working with horses on the overall severity of autistic symptoms, as well as the quality of parent-child interactions, using validated metrics developed specifically for this pervasive disorder. Twenty children with autism spectrum disorder (ASD) were evaluated 3 to 6 months before beginning the riding-and-grooming protocol, immediately before the first session, and then at both 3 and 6 months thereafter. The investigators employed the Childhood Autism Rating Scale as well as the Timberlawn Parent-Child Interaction Scale in determining benefit, both of which demonstrated positive effects that any pharmaceutical company would kill for. Of course, there were limitations in design and numbers and "the results emphasize the importance of continued research in this area." However, should anyone interview any of the thousands of therapists and parents who have watched their clients and children participate in equine-related programs over the past three decades, he or she would find few who cared about limitations in study design or the requisite call for further research or much of anything at all except that they have found, finally, a way to provide a bit of relief of the pain of not only their children but the entire family.

If a hint of editorial bias can be detected in the above paragraph, let me admit that it exists in its full glory. I have been involved in various forms of animal-assisted therapies since my days at the Program in Integrative Medicine at the University of Arizona late in the last century, and the sum of my personal observations trump any research study I have reviewed over the past 20 years. Some of the most heart-touching examples have taken place at Whispering Hope Ranch in Payson, Arizona, a haven where children with cancer, AIDS, renal failure, hemophilia, cerebral palsy, and a multitude of other health challenges spend time with similarly ill children, as well as with other parents and siblings of those affected. The ranch is also home to more than 100 animals ranging from dogs to ducks, horses, deer, and emus, and each nonhuman carries its own disability, either from congenital malformation, injury, or physical and emotional abuse. One case holds a permanent home in my memory.

Alison was a 10-year-old "low-functioning autistic" attending a weekend summer camp at Whispering Hope for similarly afflicted children and their families. She had never held sustained eye contact and was nonverbal, except for a five-word vocabulary including such words as *potty*, *hungry*, and *drink*, imprinted through years of speech therapy. Her parents brought her to the ranch with the hope that contact with the animals might elicit spontaneous verbalization or at least bring her out of her autistic shell to some small degree.

Alison was brought before Eeyore, a silver and gray donkey who had himself refused to stand or interact with any human or animal when he was first rescued and brought to Whispering Hope. Since then, Eeyore had become legendary for his patience and skill with the autistic and a topic of conversation in homes once plagued by silence and screams. A local Buddhist enclave declared the burro a *bodhisattva*, a being that foregoes enlightenment to return to Earth to serve the suffering, a declaration unchallenged by any parent whose child has stood in his presence.

All watched as the therapist repeated, "You really want to say 'Hi' to Eeyore. Eeyore loves you. Can you say 'Hi' to Eeyore?" Alison's parents were stunned to tears when their child walked over to the donkey, threw her arms around his neck, and very clearly said, "Hi, Eeyore!" At each return visit, the child ran through the property calling, "I want Eeyore! Where's Eeyore?"

Yes, I know, this is anecdotal evidence, albeit touching anecdotal evidence, with no approval from an institutional review board, no methodological structure, no inclusion of a control group, no statistical validation. Yet not one person witnessing the event cared a whit about science at that moment or since, and that is as it should be. The fact is that *anecdotal* does not mean *fictitious*; it simply means that the evidence has not met certain subjective standards established by certain subjective agencies. Indeed, the majority, if not all, of our great scientific discoveries originated as anecdotal considerations. That unusual clearing around the mold on the petri dish? The apparent decrease of infection in laboring women if hands were washed between the autopsy in the morgue and the labor and delivery room? What if Fleming and Semmelweis had written these observations off as not meeting scientific standards? No, the miracles of conventional medicine owe their very existence to the curiosity of humans. To reject anecdotal information as "unscientific" would be commensurate to historical treason.

Philosophical considerations aside, I encourage the reader to peruse the enclosed article on children and horses. It is a valuable addition to a growing body of evidence that Nature and her minions are not, in reality, our servants, but our equals, if not masters. Or as philosopher Henry Beston instructs us in his treatise *The Outermost House*,

> *We need another and a wiser and perhaps more mystical concept of animals. We patronize them for their incompleteness, for their tragic fate of having taken form so far below ourselves. And therein we err, and err greatly. For the animal shall not be measured by man. In a world older and more complete than ours they move finished and complete, gifted with extensions of senses we have lost or never attained, living by voices we shall never hear. They are not brethren, they are not underlings; they are other nations, caught with ourselves in the net of life and time, fellow prisoners of the splendor and travail of the earth.*[1]

I believe Alison and her parents would agree.

REFERENCE

1. Beston H. *The Outermost House: A Year of Life on the Great Beach of Cape Cod.* New York, NY: Henry Holt & Co; 1949:24.

ORIGINAL RESEARCH

Prospective Trial of Equine-assisted Activities in Autism Spectrum Disorder

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Background • Anecdotal reports and some studies suggest that equine-assisted activities may be beneficial in autism spectrum disorders (ASD).

Objective • To examine the effects of equine-assisted activities on overall severity of autism symptoms using the Childhood Autism Rating Scale (CARS) and the quality of parent-child interactions using the Timberlawn Parent-Child Interaction Scale. In addition, this study examined changes in sensory processing, quality of life, and parental treatment satisfaction.

Design and Participants • Children with ASD were evaluated at four time points: (1) before beginning a 3-to-6 month waiting period, (2) before starting the riding treatment, and (3) after 3 months and (4) 6 months of riding. Twenty-four participants completed the waiting list period and began the riding program, and 20 participants completed the entire 6 months of riding. Pretreatment was compared to posttreatment with each child acting as his or her own control.

Results • A reduction in the severity of autism symptoms occurred with the therapeutic riding treatment. There was no change in CARS scores during the pretreatment baseline period; however, there was a significant decrease after treatment at 3 months and 6 months of riding. The Timberlawn Parent-Child Interaction Scale showed a significant improvement in Mood and Tone at 3 months and 6 months of riding and a marginal improvement in the reduction of Negative Regard at 6 months of riding. The parent-rated quality of life measure showed improvement, including the pretreatment waiting period. All of the ratings in the Treatment Satisfaction Survey were between good and very good.

Conclusion • These results suggest that children with ASD benefit from equine-assisted activities. (*Altern Ther Health Med*. 2011;17(3):14-20.)

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Autism spectrum disorder (ASD) is a neurological disorder that limits a person's ability to function normally. Behavioral abnormalities, social limitations, sensory processing abnormalities, and an impaired ability to communicate are the main issues in this complex developmental disability.[1,2] The hallmark of the disorder is a qualitative impairment in social interaction, characterizing "autistic aloneness." Children with ASD often prefer to be alone and/or with limited interactive partners. They have difficulty understanding another's thought perspective, difficulty in reading facial expressions, and an impaired ability to communicate, which make establishing and maintaining social relationships difficult.[1] As a result, people with ASD struggle in social situations such as school, dining out, shopping, and family events. Interpersonal relationships with parents and other family members also pose difficulties, and parents of children with ASD reportedly experience higher levels of stress than parents of children with other disabilities.[3]

High-functioning adults with ASD who are able to describe their thoughts and feelings report that even though people with ASD have difficulty in relationships with other people, they may have an innate connection to animals.[4,5] Anecdotal reports suggest that equine-assisted therapy may be a beneficial treatment for individuals with ASD. For example, there have been reports of children with ASD developing language skills while participating in equine-assisted therapy. Also reported were improved balance, sensory processing, behavior, and self-confidence and an improved ability to bond and develop relationships.

Equine-assisted therapeutic activities for individuals with disabilities include therapeutic riding (TR), equine-assisted psychotherapy, or hippotherapy. Therapeutic horseback riding is

generally described as a riding program in which the primary goal is that of rehabilitation rather than the sole teaching of riding skills for recreational purposes. Many studies have examined therapeutic riding in children with disabilities, such as learning disabilities, verbal dyspraxia, cerebral palsy, and spinal cord injury, and these studies have demonstrated improvement in the fine and gross motor skills, communicative abilities, overall mood, and affect.[6-14]

For example, Barker and Dawson, using a pre- and posttreatment crossover design, assessed changes in the anxiety ratings of 313 patients admitted to a psychiatric facility over an 8-month period.[9] Among patients who participated in animal-assisted therapy, patients with mood disorders, psychotic disorders, and other disorders had a significant decrease in anxiety.

In a study done by Glazer et al, five children were involved in TR for a 6-week period, along with each of their parents and a volunteer.[11] The study examined the effect of TR on children experiencing complex grief reactions due to the loss of a family member. Confidence building; gaining a sense of independence, responsibility and pride; mastery of self and horse; overcoming fears; gaining trust, self-confidence, and self-esteem; increase in communication skills; and positive expression of the loss were all positively noted in the study. Parents and participants agreed that the TR sessions had positively benefited them in some aspect of their grief recovery process.

Bizub, Joy, and Davidson studied five adults with a long history of psychiatric disabilities and recruited them to participate in a 10-week TR program.[7] Positive outcomes were measured in identity, group cohesion, and self-confidence, and participants gained coping skills, learned new abilities, felt connectedness to the horses, and increased awareness of their capabilities. Self-esteem increases were described by the participants as an immediate outcome; they also enjoyed being in a fun therapeutic environment and displayed positive psychosocial gains.

Benda et al studied the effects of hippotherapy on the muscle activity of children with cerebral palsy by using electromyography to determine changes in postural muscle symmetry.[6] Changes in muscle activity and left/right symmetry after a hippotherapy session were compared to the effects of symmetrically sitting on a stationary barrel. Overall, the children in the horse protocol showed greater improvement in symmetry. These findings were attributed to the precise and rhythmic gait of the horse, which is similar to the human gait.

The benefits of TR are thus notable. The collective literature has identified improved coordination, increased muscle tone, improved balance and equilibrium, postural control and tone, strength, relaxation, anxiety reduction, increased participation and concentration, and increased visual perception and awareness as benefits of therapeutic horseback riding and hippotherapy.[6-14]

It appears that riding therapies can be effective interventions for children with a number of disabilities. There is some anecdotal evidence that therapeutic riding can benefit children with ASD; however, there are no controlled trials testing the effectiveness of therapeutic riding as a treatment.

This study was designed to examine the effects of equine-assisted activities on overall severity of autism symptoms using the Childhood Autism Rating Scale (CARS)[15] and the quality of parent-child interactions using the Timberlawn Parent-Child Interaction Scale. In addition, this study examined changes in sensory processing, overall quality of life, and parental treatment satisfaction.

METHODS

The research contained in this article was performed in accordance with the University of Texas Southwestern's Institutional Review Board and carried out with ethical standards set forth in the Helsinki Declaration of 1975.

Inclusion Criteria

To be included in the study, participants had to be children (1) between 3 and 12 years of age (2) with a primary diagnosis of ASD, (3) with a Childhood Autism Rating Scale (CARS) score ≥30, and (4) without previous participation in equine-assisted activities.

Participants

Forty-one participants between the ages of 3 and 12 years from the greater Dallas–Fort Worth community were initially recruited and enrolled. However, 17 participant families dropped out before starting to ride (nine participants dropped out of the study because they had an opportunity to begin the therapeutic riding program before the 3-month waiting list requirement was completed; one participant dropped out because he was injured at school; and seven participants dropped out due to family reasons). The remaining 24 participants completed the waiting list period and began the riding program. Twenty-two participants completed the first 3 months of riding, and 20 participants completed the entire 6 months of riding. The average age of the participants in the study was 7.8 (standard deviation [SD] = 2.9) years. Six participants were female, and 18 were male. Two children were black, one child was Hispanic, and 21 were white.

To participate in the study, each participating family had to provide a letter from the child's treating physician confirming the child's diagnosis. Each child was evaluated using the CARS[15] and required a score ≥30 to participate. The children's CARS scores ranged from 30 to 53. A CARS score from 30 to 36.5 indicates mild to moderate autism, and a CARS score from 37 to 60 indicates severe autism.[15] The average CARS score for the participants in the present study was 37 (SD = 5.35).

Procedure

The participants were assessed at four time points during the study: (1) when placed on the waiting list (the waiting period ranged from 3 to 6 months), (2) immediately before the participant began riding, and (3) at 3 months and (4) 6 months after the participant began riding.

Upon enrollment in the study, a packet was mailed to the family that included the parent-rated measures (these measures are described in the section about clinical measures). After the packet was received, the research assistant (RA, who did not have any information about the study aim or procedures) went to the participants' homes and completed the CARS and the Timberlawn

Parent-Child Interaction Scale. At that point, the child began the required 3-month waiting list period. Each child acted as his or her own control (data from the waiting period were compared to data from the treatment period). All measures completed at baseline were completed at each time point.

Therapeutic Riding Program

SpiritHorse is a riding program in Corinth, Texas, that uses 146 steps specific to intervention in children with ASD. These steps were developed through the study of published works and the experience from thousands of lessons given to children with ASD at SpiritHorse. Each lesson included horse management as part of the curriculum, incorporating responsibility and ownership of an assigned horse or pony. Partnership was established with the parents, caregivers, supporting health professionals, and the riding instructor of each student. The goals of the team along with the needs and interests of the student are reflected in each lesson. In addition to riding, the children were taught how to lead and brush the horse or pony and put on the bridle and saddle. These activities help the child develop a relationship with the horse and the trainer. The participants also have an opportunity to pet the horse and feed the horse carrots. This facilitates relationship building and bonding skills that can be transferred from a student, his/her instructor, and horse to his/her family and home life.

Parents and caregivers were a part of the child-horse interaction and an integral part of the lesson. Parents were "side-walkers" for their children and participated throughout the therapeutic process.

If a child was nonverbal, assistive-language devices were used to aid the child in communicating with the horse; these devices were attached to the pommel of the saddle and allowed the child to direct the horse to "walk" or "trot" by pressing the appropriate buttons to produce the verbal command "walk" or "trot." The horses were trained to understand the verbal commands from a rider and/or the assistive device.

Description of the Riding Lessons

The participants rode once per week for about 60 minutes. The lessons also included leading, grooming, and tacking responsibilities. The lessons were for a 6-month duration. Each child was introduced to the horse or pony that he or she would be riding for purposes of the study. Every effort was made to keep each child on the same horse or pony, so he or she could get to know and bond with his or her pony. In some instances, due to injury or illness, some ponies had to be substituted after the initial introduction. All of the horses and ponies were well behaved and docile with the children.

Measures

Parent-rated measures (completed by the same parent each time) and clinician-rated measures (completed by the RA who did not have any information about the study) were completed. The RAs had been trained in the use of the principal measures (CARS and the Timberlawn Parent-Child Interaction Scale) and tested for reliability.

Clinician-rated Measures

Childhood Autism Rating Scale. The CARS is a 15-item behavioral rating scale developed to identify autism as well as to quantitatively describe the severity of the disorder.[15] A total score of 15 to 29.5 is considered nonautistic; a score of 30 to 36.5 is considered mild to moderate autism; a score from 37 to 60 is considered moderate to severe autism. The CARS is a well-established measure. The internal consistency reliability α coefficient is .94, the inter-rater reliability correlation coefficient is .71, and the test-retest correlation coefficient is .88. CARS scores have high criterion-related validity when compared to clinical ratings during the same diagnostic sessions, with a significant correlation of 0.84.[15]

Timberlawn Parent-Child Interaction Scale. This measure examines Expressiveness, Responsiveness, Positive Regard, Negative Regard, Mood and Tone, and Empathy between the parent and child on a 5-point scale. The Timberlawn Parent-Child Interaction Scale measures the interaction between the parent and child through observation. Each domain is rated, and higher scores are indicative of a more positive interaction, except in Negative Regard. The Timberlawn Parent-Child Interaction Scale is a reduced version of the Timberlawn Couple and Family Evaluation Scales (TCFES). The TCFES has been used in a variety of clinical and research settings and represents one of the best observational rating scales of families available.[16-18]

Parent-rated Measures

Sensory Profile. The Sensory Profile is a 125-question caregiver-completed profile that reports the frequency of the person's response to various sensory experiences.[19] The items on the Sensory Profile are grouped into three categories: (1) sensory processing, (2) modulation, and (3) behavioral and emotional responses. The Sensory Profile has 14 sections: (A) Auditory Processing; (B) Visual Processing; (C) Vestibular Processing; (D) Touch Processing; (E) Multisensory Processing; (F) Oral Sensory Processing; (G) Sensory Processing Related to Endurance/Tone; (H) Modulation Related to Body Position and Movement; (I) Modulation of Movement Affected Activity Level; (J) Modulation of Sensory Input Affecting Emotional Response; (K) Modulation of Visual Input Affecting Emotional Responses and Activity Level; (L) Emotional/Social Response; (M) Behavioral Outcomes of Sensory Processing; and (N) Items Indicating Thresholds for Response. The Cronbach's α for the internal consistency for the various sections ranged from .47 to .91.[19] Construct validity was rated as high when compared to the functional tasks measured by the School Function Assessment. Internal validity correlations ranged from .25 to .76, suggesting that the sections of the Sensory Profile use relatively unique constructs and support the factor structure developed. Construct validity was obtained by comparing the results of the Sensory Profile to electrodermal response rating (EDR) that captures the physiological response to sensation. The EDR and the Sensory Profile showed a correlation ($P < .05$).[19]

Quality of Life Enjoyment and Satisfaction Questionnaire: General Activities Subscale Revised for This Study. The Quality of Life Enjoyment and Satisfaction Questionnaire (QLES-Q) is a

TABLE 1 The Mean and Standard Deviation of Blinded Measures Over Course of Study

	T1 Start of Waiting List	T2 Start of Riding Treatment	T3 After 3 Mo Riding Treatment	T4 After 6 Mo Riding Treatment
Childhood Autism Rating Scale (CARS)*				
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Total Score	37.74 (5.54)	36.68 (4.73)	34.93 (4.21)	34.24 (4.32)
Timberlawn Parent-Child Interaction Scale*				
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Expressiveness	3.38 (0.88)	3.37 (0.85)	3.46 (0.84)	3.39 (0.89)
Responsiveness	3.47 (0.94)	3.50 (0.85)	3.50 (0.79)	3.55 (0.82)
Positive Regard	3.52 (0.79)	3.54 (0.85)	3.47 (0.91)	3.77 (0.64)
Negative Regard	2.02 (0.71)	1.85 (.085)	1.90 (0.90)	1.61 (0.62)
Mood and Tone	3.40 (0.69)	3.50 (0.65)	3.63 (0.67)	3.74 (0.60)
Empathy	3.36 (1.01)	3.37 (0.68)	3.33 (0.58)	3.43 (0.74)

*On the CARS, a decrease in score is an improvement and on the Timberlawn Parent-Child Interaction Scale; an increase in score is an improvement on all except Negative Regard, where a decrease in score is an improvement.

measure designed to enable investigators to easily obtain sensitive measures of the degree of enjoyment and satisfaction experienced by people in various areas of life.[20] The QLES-Q is useful in a wide spectrum of populations and is sensitive to change following treatment. The QLES-Q consists of 93 items, 91 of which can be grouped into eight summary scales that were rationally derived and reflect the organization of the questionnaire. The other two items are scored separately. To lessen participant burden, for the purpose of this study, we will use only the general activities subscale. This subscale consists of 14 items, and both the test-retest reliability ($r = .74$) and internal consistency ($\alpha = .90$) scores are high. However, the QLES was shortened for this study to include only the 10 items appropriate for children with autism.

Treatment Satisfaction Survey. This measure examines the caregiver's (1) satisfaction with treatment, (2) perceived treatment benefit, (3) willingness to continue treatment, and (4) willingness to recommend treatment. It obtains global impressions of these four key elements of treatment outcome using a 5-point scale. A score of 1 represents the worst or lowest score: not being satisfied with treatment, not seeing the treatment as beneficial, not being willing to continue, and not being willing to recommend treatment to others. A score of 5 represents the best or highest score: being very satisfied with treatment, seeing the treatment as very beneficial, being very willing to continue, and being very willing to recommend treatment to others. The Treatment Satisfaction Survey (TSS) was completed by the parents at the end of the riding program.

Statistical Analysis

To test for an overall effect of treatment, analyses were conducted using a one-way repeated measures multivariate analysis of variance (MANOVA) for each of the of the primary outcome measures. To test for specific differences between each time period (T1: 3 months before the riding treatment, T2: just before starting the riding treatment, T3: 3 months after starting the riding period, T4: 6 months after starting the riding treatment), a paired *t*-test was conducted.

RESULTS

Clinician-rated Measures

Childhood Autism Rating Scale. There was an overall decrease in CARS scores over the course of the riding treatment ($F(2,15) = 4.30$, $P < .04$). Scores on the CARS did not change during the waiting period (T1 to T2: $t(21) = 1.57$, NS) but did decrease after 3 months of riding (T2 to T3: $t(21) = 2.73$, $P < .02$) and after 6 months of riding (T2 to T4: $t(16) = 3.33$, $P < .005$). Change in the

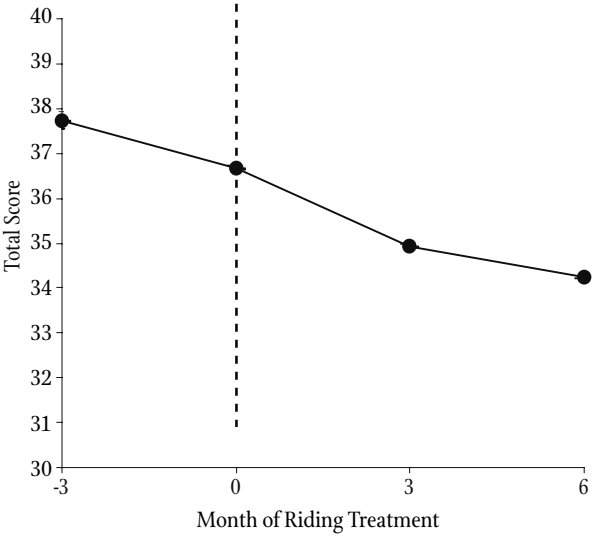

FIGURE 1 Change in Childhood Autism Rating Scale*

*A decrease in score represents an improvement. The dotted line indicates when the children began riding.

CARS scores over the course of the study are presented in Figure 1. Means and standard deviations are presented in Table 1.

Timberlawn Parent-Child Interaction Scale. None of the overall tests for Timberlawn Parent-Child Interaction Scale indicated significant changes on any of the six subscales, although tests for differences between the individual time periods showed a marginal improvement in the parent-child interaction in terms of reduction of Negative Regard over the 6 months of treatment (T2 to T4: t(21) = 1.82, $P < .07$). In addition, there was a significant improvement in Mood and Tone over the first 3 months of treatment (T2 to T3: t(21) = –3.19, $P < .005$) and over the 6 months of treatment (t(16) = –2.62, $P < .02$). Caution should be used in interpreting these results, as the overall MANOVA was not significant (Figures 2 and 3). Means and standard deviations are presented in Table 1.

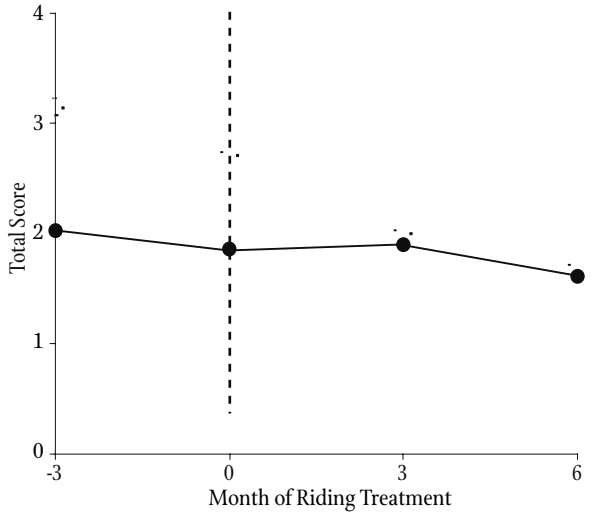

FIGURE 2 Changes in the Timberlawn Parent-Child Interaction Scale: Negative Regard*

*Negative Regard over the course of the study. This suggests a decrease in negative regard between the parent and child. The dotted line indicates when the children began riding.

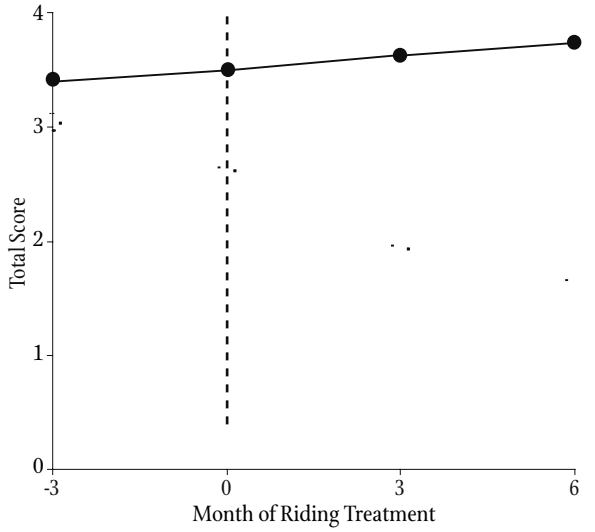

FIGURE 3 Changes in the Timberlawn Parent-Child Interaction Scale: Mood and Tone

*This suggests an improvement in the mood and tone between the parent and child. The dotted line indicates when the children began riding.

Parent-rated Measures

Sensory Profile. Analyses of the Sensory Profile were conducted using the vestibular, touch, auditory, and visual subscales, but sensitivity to (or low-threshold) and sensory-seeking (or high-threshold) items were examined separately. None of the overall MANOVAs indicated significant changes for these eight subscales. However, individual analysis showed a statistically significant improvement in Auditory High Threshold from (T2 to T3: t(21) = –2.52, $P < .02$) and (T2 to T4: t(17) = –2.47, $P < .03$) (Figure 4). Caution should be used in interpreting these results as well, as the overall MANOVA was not significant. In addition, the Sensory Profile was not blinded. Means and standard deviations are presented in Table 2.

Quality of Life Enjoyment and Satisfaction Questionnaire: General Activities Subscale. There was an overall increase in the parent-rated quality of life (F(2,14), $P < .02$). However, examination of the means demonstrated changes from the 3 months prior to the start of riding, as well as changes during the riding treatment (Figure 5). It is possible that this effect may be due to enrollment and not specific effects of treatment, as the improvement was seen throughout the course of the study.

Treatment Satisfaction Survey. The TSS was completed by the parents at the end of the riding program (n = 18). The average score for satisfaction with treatment was between good and very good (mean = 4.5, SD =.79). The average score for perceived treatment benefit was between good and very good (mean = 4.1, SD =.87). The average score for willingness to continue treatment was between good and very good (mean = 4.6, SD =.51). The average

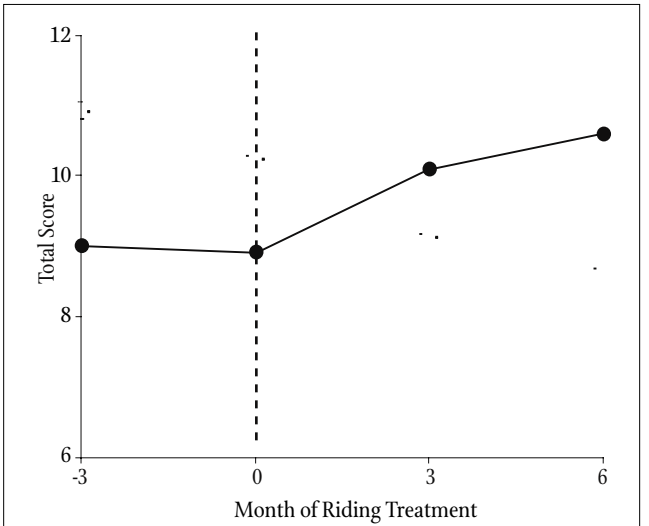

FIGURE 4 Changes in High-threshold Auditory Processing

*An increase in score represents an improvement. The dotted line indicates when the children began riding.

TABLE 2 Sensory Profile: Mean (SD)*

Sensory Profile	T1 Start of Waiting List	T2 Start of Riding Treatment	T3 After 3 Mo Riding Treatment	T4 After 6 Mo Riding Treatment
Auditory high-threshold	9.00 (2.30)	8.91 (2.74)	10.09 (2.27)	10.61 (2.06)
Auditory low-threshold	16.43 (4.32)	16.50 (3.56)	16.45 (4.40)	18.18 (2.88)
Visual high-threshold	6.26 (1.89)	6.64 (1.81)	6.59 (1.87)	7.44 (2.01)
Visual low-threshold	26.42 (5.11)	26.45 (4.32)	27.02 (5.20)	27.56 (5.23)
Touch high-threshold	24.57 (5.71)	25.32 (5.22)	25.36 (5.30)	25.39 (4.98)
Touch low-threshold	40.84 (7.99)	42.00 (7.72)	41.45 (7.84)	43.07 (5.23)
Vestibular high-threshold	16.35 (4.15)	17.00 (4.43)	18.64 (4.27)	17.67 (4.41)
Vestibular low-threshold	27.70 (2.41)	26.86 (3.20)	27.88 (3.61)	27.17 (3.13)

*An increase in score represents an improvement.

score for willingness to recommend treatment was between good and very good (mean = 4.4, SD =.84).

Disclosure of Medication or Other Treatment Changes During the Study

Because this study was relatively long, over a period of about 9 months to a year for some of the participants, changes in medications and other therapies were not preventable. Parents were asked to disclose any changes over the course of the study. During the waiting period, five children were reported to have a change in medication and four children were reported to have a change in therapy (eg, speech or occupational therapy). During the course of the first 3 months of riding, two children were reported to have a change in medication and four children were reported to have a change in therapy. During the course of the last 3 months of riding, one child was reported to have a change in medication and no children were reported to have a change in therapy.

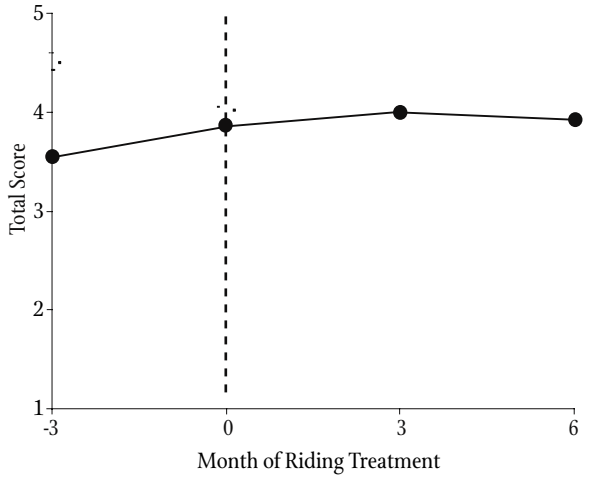

FIGURE 5 Changes in Quality-of-life Measures

*An increase represents an improvement. The dotted line indicates when the children began riding.

DISCUSSION

In the current study, a reduction in the severity of autism symptoms occurred with the therapeutic riding treatment. Specifically, there was not a change in CARS scores during the pretreatment baseline period; however, there was a significant decrease after treatment at 3 months and 6 months of riding. This result suggests that children with ASD may benefit from equine-assisted activities in regard to the core features.

Overall, there was little effect on the quality of parent-child interactions as seen in the Timberlawn Parent-Child Interaction Scale. Only changes in the Mood and Tone subscale were significant during the riding therapy. The tests for differences between the individual time periods showed a significant improvement in Mood and Tone over the first 3 months of treatment as well as over the 6 months of treatment and a marginal improvement in the parent-child interaction in terms of reduction of Negative Regard over the 6 months of treatment. These results also suggest that it would be worthwhile to explore this issue in a larger population and that the Timberlawn Parent-Child Interaction Scale is sensitive to the interaction between parents and their children with ASD.

The study included the Sensory Profile in order to examine potential changes in sensory processing. Positive trends were seen on the Sensory Profile High Threshold Auditory Processing, suggesting that the children's attention may have improved with treatment. The fact that more differences were not found may be due to the limited sample size and the nature and extent of variation in the types of sensory abnormalities/differences in these children.[2] Therefore, selection based on specific processing differences may need to be a part of the selection process to examine changes in sensory processing.

Improvements were seen in the quality-of-life measure over the entire course of the study. This finding suggests that just enrolling in the program may have created a sense of achievement and therefore a positive change in the participants' and their families' quality of life.

All of the ratings in the Treatment Satisfaction Survey were between good and very good. This result suggests the parents were

satisfied with the program and considered it beneficial.

In the measures that were not statistically significant, positive trends were noted. Qualitatively, parents stated that their children seemed to enjoy the riding and began to look forward to their lessons. No injuries or other problems occurred during the study.

STUDY LIMITATIONS

The current study was designed to provide a test of the effectiveness of therapeutic riding for children with ASD using raters who were blind to the treatment phase for the primary outcomes and the period prior to the riding as the control. Thus, the results are limited in that participants were not randomized into treatment conditions. An additional limitation is that only a small number of children were enrolled in the study. Finally, it was difficult to control all factors and keep them consistent throughout the study. For example, although every effort was made to keep the child with the same pony or horse and the same instructor throughout the study, some of the ponies and horses became lame or just needed rest, and there were some instructor changes. The lessons were to be every week without interruption; however, lessons sometimes had to be rescheduled due to weather.

CONCLUSION

The study outcomes suggest that equine-assisted activities confer benefits to individuals with ASD. In addition to the measured outcomes, parents expressed that equine-assisted activities had benefited their child and improved their quality of life. Taken together, the results emphasize the importance of continued research in this area.

Acknowledgments

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