Case Studies: Exploring the Impact of Equine-Assisted Activities on the Physical and Behavioral Health of Two Pre-Adolescent Males on the Autism Spectrum

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Abstract

Two in-depth case studies of pre-adolescent males diagnosed on the autism spectrum who were having difficulty in school were studied over sixteen (16) weeks in seven (7) sessions. Both received therapeutic riding and/or hippotherapy in addition to a clinic-based special education classroom and recreational therapy with and without dogs. Individualized education plan goals for both participants were identified as targets for change. In addition to data from evidence-based standardized instruments, observational data on successful tries in the arena, the recreational play area, and special classroom were also collected. Findings suggest equine-assisted treatment aided the participants’ abilities to follow directions, ask for needs and wants, and improved their behaviors in the classroom for several days after therapy. These findings strengthen the argument for adding therapeutic riding and/or hippotherapy to existing classroom-based therapeutic approaches for school-aged children with autism who are experiencing difficulty in school.

Keywords: autism spectrum; case studies; equine-assisted treatment; hippotherapy; individualized education plans; therapeutic riding
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Introduction

A set of atypical human conditions forms the autism spectrum – an array of human impairments to the ability to appropriately interact, behave, and communicate with others in socially acceptable ways. According to the 4th edition of the Diagnostic and Statistical Manual (DSM-IV) of the American Psychological Association, the “…domains for Autistic Disorder currently include impairments in Communication, Social Interaction, and Restricted Interests and Repetitive Behaviors” (Autism Research Institute [ARI], 2013, p. 1).

With the advent of the 5th edition, the first two domains will be combined into one: the Social/Communication Deficits domain. The Autistic Disorder, Asperger’s Disorder, and PDD-NOS diagnoses will be replaced by an over-arching diagnosis: Autism Spectrum Disorder (ARI, 2013), within which distinctions will be made based on severity – Levels 1, 2, or 3. In addition, there is no longer a related diagnosis that requires delay in language development (ARI, 2013).

Though the criteria for the diagnosis are changing, the number of children diagnosed on the autism spectrum will undoubtedly continue to rise. As these children transition through school, many will experience difficulties with motor control and sensation (Lord & Paul, 1997); for some of these children, such disorders may be further associated with depressed cognitive and language functioning. These challenges may mean they will face difficulties in their school settings. In fact, approximately 40% of these cases are accompanied by mutism (Lord & Paul, 1997). As a consequence, these individuals may struggle to participate in typical childhood activities – ultimately impacting their ability to successful transition through adolescence into adulthood.

Literature Review

A growing evidence-base supporting the use of animal-assisted therapy with children with autism suggests that therapeutic human-animal interaction is becoming a popular option for treating a
variety of disabling human developmental disorders. Literature to date indicates that animal-assisted
treatment strengthens “cognitive, psychological, and social domains…[and] influences physiological
factors, such as lowered blood pressure, heart rate and decreased anxiety” (Bass, Duchowny, & Llabre,
2009, p. 1261). Over the past decade, a growing number of studies have looked at animal-assisted
therapies with children with developmental disorders, including Autism Spectrum Disorder (ASD)
(American Hippotherapy Association [AHA], 2010; Bass & Llabre, 2010; Bass et al., 2009; Candler,
2003; MacKinnon, Noh, Lariviere, MacPhail, Allan, & Laliberte, 1995; Shurtleff, Standeven, &
Engsberg, 2009).

Most animal-assisted therapies use animals as problem-solving or task-centered tools in an
outdoor, natural setting. In the specific area of equine-assisted therapies, the evidence is growing in
large part to mostly qualitative and/or quasi-experimental studies, with new, ground-breaking studies
being proposed (Shurtleff, 2012). Recently, studies of individuals diagnosed with ASD have examined
the effects of therapeutic riding and/or hippotherapy on small groups of children (Bass et al., 2009).
Over a period of several weeks of intervention, these children experienced an increase in self-esteem,
self-efficacy, and speech and language abilities. While producing limited quantitative data, findings
did suggest that some participants in the equine-assisted treatment groups were more successful than
traditional therapy – but not others (Bass et al., 2009). Another study of a larger group (N = 17) of
children with cerebral palsy found that all domains of gross motor functioning improved after eighteen
(18) weekly sessions of hippotherapy (Sterba, Rogers, France, & Vokes, 2002).

Recently, a pilot study of 42 participants diagnosed on the autism spectrum between the ages of
six (6) and 16 participated in therapeutic riding program for 10 weeks. When comparing the results of
that group to a waitlisted control group, the therapeutic riding group showed significant improvements
in the ability to self-regulate across feelings of irritation and tiredness, and behaviors typical for the
autism spectrum, as well as hyperactivity. This study was important because the researchers found
improvements in self-regulation due to the therapeutic riding experience (Gabriels et al., 2011).
The relevant literature on case studies of equine-assisted therapy has found benefits to self-esteem, confidence (self-efficacy), and social skills (interaction); in addition, there appear to be long-term effects that influenced the participants’ daily lives and relationships (Bergen, 2003; Glazer, Clark, & Stein, 2004). In her case study, Bergen (2003) discovered that benefits included skills-building that could translate into the future.

In their small cohort study of five (5) individuals between the ages of four (4) and fourteen (2004), Glazer, Clark, and Stein found results of a six (6) week hippotherapy program included higher levels of self-esteem, stronger communication skills, and stronger self-confidence and feelings of trust – all which positively impacted their other relationships. Lehrman and Ross’ studied the effects of ten weeks of hippotherapy on a ten-year-old female with visual impairment and multiple disabilities. They reported that, during the study, she became more verbal, was able to stand and sit independently, her use of vision improved, and her attention span increased (2001).

**Equine-Assisted Activities**

*Therapeutic horsemanship/therapeutic riding.* Therapeutic horsemanship is a category of equine-assisted activities and therapies. Various activities may include interactive vaulting (jumping poles or fences), therapeutic driving (controlling a horse-drawn carriage), and therapeutic riding (riding with English or western gear). Therapeutic riding is used to positively impact individuals’ physical, mental, emotional and social well-being (Professional Association of Therapeutic Horsemanship International, Inc. [PATHIntl], 2013).

In therapeutic riding, the individual prepares for, participates in, and completes a horseback riding session or sessions. A typical session includes getting the horse from the barn or stall, haltering, grooming and saddling the horse, riding the horse, and then dismounting, removing and stowing the saddle and other gear, grooming the horse, and then returning the horse to the barn or stall. Various gaits of the horse are used therapeutically – from walk to trot to lope/canter. Here, the rhythm of the experience and the balance required to stay atop a horse and in control have been found to strengthen
physical and mental/emotional capacity, and importantly strengthen mastery and self-esteem (PATHIntl, 2013).

**Hippotherapy.** Hippotherapy is a sub-category of animal assisted activities and therapies used to provide carefully measured motor and sensory input (AHA, 2010). In hippotherapy, a combination of physical, occupational, and speech and language therapies are used in conjunction with the individual who sits on a horse that may be standing still or walking. Neurological functioning and sensory processing are measured during treatment, the outcomes of which focus on improving the individual’s abilities to successfully complete a wide range of daily activities. During hippotherapy, the horse’s movement is used to influence the human’s movement; during therapeutic riding, the opposite is true. So, unlike therapeutic riding (where specific riding skills are taught and mastered), the movement of the horse in hippotherapy is the path to treatment (AHA, 2010).

Today, a variety of animal-assisted treatments for ASD exists; yet there remains no real consensus as to the efficacy of one treatment over the other (Bass et al., 2009). A number of children on the autism spectrum participate in some form of animal-assisted therapy; though more studies have noted its impact on social and sensory impairment, and adaptive and engaging behaviors, fewer in number have shown growth in motor performance or communication development (Bass et al., 2009). Thus, we join Shurtleff (2011) in seeing a need for additional research into therapeutic riding and hippotherapy on the motor performance, as well as communication development, of children on the autism spectrum.

**Methodology**

**Background of Study**

A small cohort of eight (8) children was identified by their special education instructor as having difficulty with behaviors in school. Funded by a small grant from the school system in addition to funding from the local county for “Social Services Community Event Sponsorship,” a special classroom at the local university hospital’s children’s psychiatric clinic was formed for the cohort. A
partnership between the clinic and a local non-profit therapeutic horsemanship agency provided the human and animal resources on-the-ground to conduct the study. This small cohort was to come to the clinic ultimately to meet their individualized education plan goals as identified by the instructor. The treatment options would be partially up to the researchers and partially based on the current treatments offered by the clinic, and their plan goals would provide the targets for behavior change.

Subjects

The instructor identified two pre-adolescent males for our study who had been part of her classroom in the public school system. These two participants were selected because she knew both their families’ histories and because she had worked with their guardians successfully prior to the study. She determined that both would be appropriate for our study, and she contacted the guardians, who gave their informed consent for them to participate.

Our two participants, hereafter identified as Carlos and James (pseudonyms), were like many individuals with autism. Each experienced some degree of difficulty sensing, hearing and seeing simultaneously, multi-tasking, and processing visual data. In their classroom and clinical treatment settings, the Picture Exchange Communication System by Bondy & Frost (2011) and voice output communication aids/speech generating devices were often used to communicate. This is because social deficits, communicative difficulties, repetitive behaviors and interests, and, in some cases, cognitive delays – all can be part of the experience of a person with autism (Charman et al., 2012). As part of the traditional treatment milieu for our participants, a combination of these traditional communication tools were used.

Thus, the two in-depth case studies were, in actuality, an outgrowth of their clinic classroom experience. We were hopeful that therapeutic riding and/or hippotherapy would improve Carlos’ and James’ communication skills, visual-motor integration, bilateral integration, and core stability over time. We believed that the addition of these therapies to the traditional treatments of their special classroom and pet therapy would improve their graded control and quality movements, as well as fine
motor activities that required precision and dexterity, and we anticipated overall improvement in elements of each participant’s motor repertoire.

**Time-Line**

Our two in-depth case studies explored the effects of adding therapeutic horseback riding and/or hippotherapy to a special clinic classroom and recreational therapy both with and without dogs. Carlos and James were studied over the course of sixteen (16) weeks that began in early October 2010 and ended in mid-January 2011. However, a winter break of eight (8) weeks began in mid-November and ended in early January, during which there was no observation and no treatment or classroom.

A total of seven (7) sessions were offered during the entire time period – the first six were in weekly succession, followed by the last session after winter break ended. The following is a table of the study’s time-line with identified activities, dates, and months in a color-coded format.

Insert Table 2 about here

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**Measurement Instruments**

We used the *Bruininks-Oseretsky Test of Motor Proficiency* (2nd ed.) (BOT 2) and the *Test of Early Communication and Emerging Language* (TECEL) by Huer & Miller (2011). Both instruments have been used by educators and scholars for over 25 years. The BOT 2 measures gross and fine motor skills; for example, visual-motor integration and stability, as well as the impact of timing, sequencing and endurance on the inventory of motor skills. Originally known as the *Nonspeech Test*, the TECEL assists with “…assessing and charting communication and language strengths and weaknesses… designing intervention plans… making estimates about future language development… [and serves] as a research tool for investigating early communication and emerging language” (TECEL, 2011, p. 2).

Insert Table 1 about here
Case Subjects

Carlos was a Hispanic African-American pre-adolescent male aged 12 years 9 months at the completion of the study. He suffered abuse as a child and was referred into the foster care system, where he continued to experience abuse. Eventually, Carlos was adopted by a single female. Carlos was in the special classroom and treatment with CPC due to being non-verbal and exhibiting challenging behaviors; e.g., throwing and breaking objects.

Data Collection

Six professionals participated in the data collection. One individual was a licensed speech and language instructor, one was a retired speech and language instructor, one individual was a certified occupational therapist, one was a certified therapeutic recreation specialist and graduate social work student. All these individuals were experienced in handling horses. They were joined by two special
education teachers - one from the local public school system, and one who taught in the special education clinic classroom.

These experienced professionals spoke together often and compared their notes frequently. Each played an important role – researchers with expertise in recreation therapy and speech and language pathology joined instructors with expertise in therapeutic riding and hippotherapy. We used repeated measures in three different contexts – the special education clinic classroom, the recreation therapy groups with and without dogs, and the arena. In addition to the TECEL and BOT2 data, interrater observational data were kept throughout the entire study in journals. Each participant’s motor and communication skills, and tasks and responding behaviors were documented and quantified by each observer. Each week, during arena and recreation therapy observations, data from the TECEL and BOT2 were collected, as well as general behavioral observations. General observation data from the classroom were also collected during the last 30 minutes of morning – just before lunch.

**Intervention**

The following is a description of a typical therapeutic riding and/or hippotherapy session. The two participants rode in an agency van with their therapists for approximately 20 minutes to the equine facility. Prior to Carlos and James arriving at the arena, the on-site equine instructors would prepare the horses for the sessions. Upon opening the gate, participants would see the horses already in tack and waiting at the fence. They would don their helmets and therapy belts. Each would give greetings such as “Hi” to their respective instructors. Some initial grooming took place, and each was observed by the instructor to assess readiness for the session.

With the exception of one session (due to logistics), both participants worked in one arena at the same time. A couple of laps around the arena came next, with the participant walking the horse alongside the leader/horse handler, who held the lead rope. This served to calm the participants and get their physical body in motion. Assisted by the instructor and a side-walker, the preliminary assessment for safety and readiness for the session continued until it was time for the participant to ride.
Tasks involving speech and motion are built into the riding and/or hippotherapy experience at every turn. An active experience, therapeutic riding requires the rider be in charge of direction, though pace is typically determined by the therapist and/or the side-walker. Hippotherapy, on the other hand, is a passive experience that requires the rider to sit atop the horse while the therapist and the side-walker stand near the horse and/or move the horse slowly in the arena.

During therapeutic riding and hippotherapy, movements that stretch the human torso are used, as are riding at various gaits – walk, trot, and/or lope/canter – all might happen, depending on the readiness and skill-level of the rider as evaluated by the therapists and instructors. In speech and language therapy, instructions are focused on tasks using objects that have already been placed in the arena for the sessions. Brightly colored buckets, balls, swim noodles, and pylons of various colors are used as tools for learning and skills development.

The majority of the seven (7) sessions of our study began with therapeutic riding (including some tasks that were to be attempted and hopefully accomplished) and ended with speech-language and/or hippotherapy, as this order proved to be most effective with the participants. In some cases, in addition to the colored tools mentioned earlier, a “sensory trail” comprised of soft inflatable objects such as balloons or strips of colored plastic attached to metal barrels and/or wooden 4” x 8’ beams would be strategically laid out on the sandy surface of the arena. It is important here to remind readers that horses used for such therapies have the training and experience to be calm in and around objects that would normally scare a typical horse. Not every horse is a good therapy horse; neither is every dog a good therapy dog. Addressing how these animals are identified, trained, and used in therapy is beyond the scope of this article.
Both teams of professionals worked simultaneously with their riders. In one arena, James rode a horse that was led by the therapeutic riding instructor. The side-walker was the retired speech and language therapist, and the special education instructors observed. At the same time, in the next arena, Carlos rode a horse that was led by the recreation therapist. The side-walker for Carlos was an occupational therapist. The same special education instructors observed both James and Carlos. At the end of each session, the participants worked with the instructors to unsaddle and brush and groom the horses as part of the experience. “Goodbyes” were said, and a snack was served when the participants returned to the van. The instructors and therapists debriefed in the arena while the participants were having snacks and getting settled in the van for the ride back to the clinic.

Carlos’ Experience

The first session took place on October 6, 2010. According to observation, Carlos appeared anxious. He was spitting into a trash can before leaving for the facility, but did stop while there. Carlos appeared very calm on “Joe” – the horse selected for Carlos for this session, and did not show anxiety on him. Carlos followed most directions except the direction to “Whoa.” When asked to “Whoa the horse,” Carlos would push the “Ride on” button on the voice output communication aids/speech generating device. It appeared as if Carlos didn’t want to stop and was requesting to “Ride on.” Eventually, “Whoa” was taken off the device’s options and instructors stopped the horse when it was time. Carlos signed multiple times, approximately five times to go to the bathroom, but would not use the wheel-chair accessible port-a-potty the barn.
The second session took place on October 13, 2010. According to observation, Carlos appeared anxious to get started today, and was quick to exit the van. Carlos helped brush Joe, but at arm’s length because of his anxiety and fear. Carlos was able to get on Joe’s back semi-independently, with some help. Carlos was given request options and then presented with the voice communication device. Carlos picked the brightly colored plastic swim noodles often, and at times needed one physical prompt, like a tap on the arm, to respond. Carlos needed prompts to sit up on Joe and showed an ability to right himself with prompts (one time). Carlos signed often for the bathroom, and attempted to take his helmet off a lot. Carlos did go to the bathroom with a volunteer after he got off Joe’s back. Carlos appeared tired, sat in a chair afterwards, and drank water. Carlos verbally said “Goodbye” to the instructors before leaving.

The third session took place on October 20, 2010. According to observation, Carlos entered the gate with a peer, appearing to know where to go. Carlos initiated retrieving his helmet, choosing a different color. He groomed Joe, moving closer to him that day at the start. Carlos signed for the bathroom before getting on Joe, and did go to the port-a-potty. Carlos sat up straight and looked ahead when redirected to do so. He identified colors of buckets sitting atop barrels in the arena with the voice communication devise when asked by pointing. He showed an increase in focus on the tasks today. During hippotherapy, Carlos was given choices at the end of the session – whether to go “fast” or “slow” and he chose “fast.” Carlos had his eyes closed while going fast and a smile on his face, showing no stress or anxiety. After getting off Joe, Carlos sat in a chair, appearing calm. He seemed to have discharged all of the anxiety from his body. Carlos said “Goodbye” and “Thank You” with signs and prompts from the instructors’ eye contact at the end of the session.

The fourth session took place on October 27, 2010. According to observation, Carlos walked in, found his helmet and put it on – all with one prompt. Carlos signed for the bathroom and then went to the bathroom. The weather was breezy. Carlos used the voice communication devise 100% of the time without prompts to tell Joe to “Ride on.” Carlos needed more prompts for other tasks. Carlos
continued to be bothered by his helmet, needing prompts to leave it on. Carlos drank three bottles of water. Afterwards, Carlos threw up in the van, possibly because of drinking too much water.

The fifth session took place on November 10, 2010. According to observation, Carlos appeared more excited and animated, with an increase in vocalizations at the start of the session. Carlos appeared distracted at times by James who was, for the first time since starting the study, in a different arena. This was one of several new situations this session. Carlos was separated from James and he was given a new horse named “Summer” to ride. Summer was selected for Carlos by the occupational therapist specifically due to his typically slumped-over posture. Carlos needed many prompts to point and look at colored buckets. Carlos would eventually point to the correct buckets but appeared to be silly (spunky) about it at first. Carlos was able to point out his horse’s ears, mane, and tail after a few introductory prompts. Carlos also clearly said “No” when asked if he wanted to keep going at the end, and he signed “All finished.” Carlos seemed interested in his horse’s tail and was spending extra time brushing it – an activity completely self-initiated.

The sixth session took place November 17, 2010. According to observation, Carlos appeared overly focused on his therapy belt; however, when the belt was changed, he stopped, and became more focused. Carlos then responded well to both therapeutic interventions. Carlos spent more time brushing his horse this session and appeared to like brushing her tail and mane.

The seventh, and final session, took place one week after the BOT2, on January 19, 2011. According to observation, Carlos appeared silly and hyper today. However, while on the horse, he appeared focused. Carlos could identify where buckets with grooming tools were and was accurate all but one of three times. Carlos showed effort in vocalizing the sound “Boo” for telling the horse to “Go”. He needed the cue “Use your words,” to do so at times. Carlos sat sideways on the horse and threw a ball into a basketball net. He was silly and laughing throughout this task. During grooming (off the horse) Carlos was still acting silly and off task. Firm re-directions were given by the instructors,
and then Carlos was able to groom. Near the end of the session, Carlos walked around the arena with the occupational therapist, which helped him calm down.

It is worth noting that Carlos was participating in recreation therapy with dogs at the clinic. There seemed to be a transfer of learning whereby Carlos would walk the dogs and brush them much as he would the horses and his recreation therapist was seeing connections between all of the therapies. Importantly, the anxiety Carlos was expressing went down in recreation therapy with the dogs, and there was more eye contact with Carlos and less anxiety overall.

**James’ Experience**

The first session took place on October 6, 2010. According to observation, James followed not only direct instructions but also responded appropriately to “Yes/No” questions and “Which one?” questions. He also correctly named all the obstacles, and he identified the blue and yellow poles by calling them by their color names.

The second session took place October 13, 2010. According to observation, James was paired with “Speedy” – who ended up being his horse for the duration of the study. James was able to use gentle brushing today and move the brush with the direction of Speedy’s hair. The instructors began in a “sensory trail” arena with two-step directions but changed to a simpler form because too much time elapsed between activity areas – obstacles may have been too far apart due to the size of the arena. When the directions were simplified, James became much more accurate. Toward the end of the session, he became visibly tired, but finished the session.

The third session took place October 20, 2010. According to observation, James immediately brushed the horse using the correct directions with increased accuracy and was not showing any signs of fatigue. He seemed to enjoy the activities that included naming and identifying colors on objects in the arena.

The fourth session took place October 27, 2010. According to observation, James was distracted in this session by the wind and the dust in his eyes, as well as by workmen across the street
from the barn. In addition, at the beginning James was so focused on using “Walk on,” “Whoa” and steering the horse, his hearing may have been impacted – which seems to interfere with his attending to communication commands made by the instructors. When the instructors included the commands to his horse with their external commands, James was able to follow the two-step directions with greater accuracy. For example, “Tell Speedy to go over the bridge and stop after the bridge” was used instead of “Walk on” and then the second direction.

The fifth session took place November 10, 2010. According to observation, James was relaxed and playful. His attention seemed more focused on both cueing his horse and following the instructors’ two-step directions. He spontaneously initiated some conversations with the side walker (the volunteer that walks at the side of the horse during a session, as compared to the leader who maintains control of the horse and safety for the rider). The two exchanged a moment of glee when James caught the side-walker’s eyes and bent down and mouthed the words, “Walk on” in her ear. She responded back, “You’re so funny! I don’t know what I’m going to do with you!” at which James responded with a big smile as if he understood the idiom (unusual for a child with autism). At one point, in the middle of following a two-step direction, James became distracted by standing water next to a water tank, but he recovered and was able to complete the second step. Importantly, James spontaneously told his horse to “Back up” appropriately – a command not currently asked for or being worked on.

The sixth session took place November 17, 2010. According to observation, James was playful in this session and seemed less distracted than during the session from the previous week, possibly due to the existence of fewer external stimuli in the environment. James was partially successful with steering, walking on and stopping without anyone leading Speedy. James was considerably more successful following directions, especially if the directions were predictable and one-way; e.g., putting the letters in the mailbox and the balls in the bucket rather than taking them out.

The seventh, and final session, took place one week after the BOT2, on January 19, 2011. According to observation, James successfully followed two-step directions with a new activity:
matching a picture on a card with the same picture on a sign randomly posted upon the walls inside the barn. He was successful selecting the correct picture out of two choices but not three. He also used his horsemanship skills fairly consistently.

While at the facility, after the sessions, James would walk up and down the fence line and talk to the horses. At one point, James took his hands and moved Speedy’s face so that the horse was looking at him when James talked to him – a behavior that was often asked of James when interacting socially with people. During this time, James also increased his cooperation in recreation therapy and was able to work on two-step directions at the clinic during those groups.

It is worth noting, that James was also able to transfer some skills from therapeutic riding to recreation therapy with dogs. James was observed using some skills that he was learning with the horses with the dogs. James would ask to walk the dogs at the start of the session – an action similar to what he would do with the horse in the arena. In fact, James showed a new interest in brushing the dogs, which was either difficult to get him to do before he worked with the horses or something in which he had lacked interest.

Results

We were interested in whether Carlos’ and James’ individualized education plan goals would be met as part of our study; in fact, both had plan goals that were targets for change during the study. Carlos and James participated in social skills groups, recreation therapy with dogs, speech/language therapy, and therapeutic riding. Carlos also participated in hippotherapy.

Carlos’ IEP goals. Carlos had individualized education plan goals that provided the targets for outcomes from his treatment activities and tasks in our study. When presented with alternative means of communication, Carlos will (1) appropriately choose items or activities and interact with them at 75% accuracy; (2) follow directions with no more than one (1) redirection to maintain 75%, including physical prompting; and when presented with alternative means of communication and adult prompts,
Carlos will (3) demonstrate positive ways to express needs, wants and feelings (without hitting or throwing) no more than one (1) time per day on four (4) out of five (5) opportunities.

James’ IEP goals. James also had individualized educational plan goals that provided the targets for outcomes from his treatment activities and tasks in our study. When presented with one step visual and verbal prompts, James will (1) follow three out of four directions with no more than one (1) incident of physical aggression per week on four (4) out of five (5) opportunities; in one year, James will (2) when presented with a variety of opportunities to communicate (greet, request, question) use each function at least once per day, in a way that would be easily understood by most individuals, four (4) out of five (5) opportunities.

Our results indicated an increase in the capacity and ability for both Carlos and James to follow more complex directions and an increase in their asking for wants and needs was observed throughout the study. The horses were being given appropriate cues more frequently, and according to the special education teacher at the clinic, both Carlos and James exhibited improved behaviors for several days after each session.

Carlos’ IEP Outcomes

Carlos responded to the use of the voice communication devise in recreation therapy. The therapist remarked that prior to the study, Carlos would often point at things in group and she was unsure of what he wanted. She also noted that Carlos still needed more than one prompt at times, but in all honesty she wondered to herself whether anyone could do things on the first prompt all the time. Importantly, Carlos had improved on hitting and/or throwing in group, so she thought he could also benefit from therapy with dogs should he become less afraid of them.

Based on these results and observations made by the team throughout our study, the communication and language portion of Carlos’ individualized education plan could be amended to include the following annual functional and academic goals: In the next school year, Carlos will: (1) take at least three conversational turns when conversing with an adult at least twice per week, (2)
respond appropriately to at least three yes/no questions and two why questions at least once per week, (3) use at least two personal pronouns appropriately, (e.g., my, mine, your, yours) at least once per week, (4) demonstrate understanding of the difference between big and little and will expressively use “big” appropriate to indicate relative size (e.g., “big” meaning “bigger than” a similar, smaller object), and (5) spontaneously ask at least appropriate two why questions per week.

James’ IEP Outcomes

According to his recreation therapist, James met his first goal during the study. He followed directions with fewer than two (2) prompts but would sometimes say “No thank you,” then do what was asked anyhow. She also noted that James was not aggressive and had not been aggressive over the past year that she worked with him. Regarding his second goal, James was working on complete sentences and developing more appropriate greetings. He could also benefit from recreation therapy with dogs because he had a habit of going right up to dogs without asking permission. She believed James could work on asking the dog’s owner for permission to work with them, and later, she saw him giving better commands to the dogs in recreation therapy group.

Based on these results and the observations made by the team throughout the study, the communication and language portion of his individualized education plan could be amended to include the following annual functional and academic goals: In the next school year, James will: (1) use two personal pronouns other than I, me, or you at least once per week in appropriate circumstances; (2) use one regular plural marker –s (e.g., “the dogs are playing) and one irregular plural form (e.g., children) on three appropriate nouns per week; (3) use four possessive pronouns other than my, mine, your, yours; (4) use five prepositions per week in a way that is appropriate (e.g., using “in” to mean “inside” or “go into,” using “on” to mean “on top of,” using “behind” to mean “in back of,” etc.); and (5) use the regular past tense marker –ed and one irregular past tense marker (e.g., swam, ran, ate, rode) on three appropriate verbs per week.

BOT2 Outcomes
Overall, written comments on the BOT2 reflected the following. Carlos showed a minimal ability in all motor areas, with compensatory strategies that help him hold his body up against gravity. It was recommended that Carlos have more opportunities to increase core strength, control and stability, and opportunities to participate in sensory-motor activities that would give him more feedback within his body.

On the BOT 2, James showed a scattering of skills ranging from 4 years, 10 months to almost 10 years. James had adequate visual-motor integration skills, bilateral integration and core stability. For James fine motor skills were more difficult, and he needed opportunity to practice precision and dexterity – more opportunities to control and refine his gross and fine motor movement, and more opportunities that provide deep pressure inputs through his hands for refined control finger movements. For the purposes of this article, the following is a table showing each participant and their BOT2 scores. We were not interested in comparing the two participants but rather looking individually at each participant’s performance and progress.

TECEL Outcomes

Based on his responses to the items on the TECEL, Carlos appeared to be transitioning from the Prelinguistic to the Emerging Language stage of development. In general, Carlos showed limited responsiveness to his environment, including other people. His profile indicated that he was just beginning to engage in actual conversations, he responded infrequently or inappropriately to most questions, and his understanding of syntax and morphology was at a basic developmental level.

Based on his responses to the items on the TECEL, James was more developed on his receptive language abilities than on his expressive language abilities. Developmentally, his language was at the Emerging Language stage with the following specific areas of strength: knows names of objects and/or
pictures; uses signals (word, movement, gesture) meaningfully; follows directions, including two verbal directions with no accompanying gestures, and three verbal directions, presented one at a time; initiates conversation and vocalizes sentences; knows appropriate body parts; attends to, identifies, and names objects and pictures; uses two-word utterances; and uses three-word sentences and asks basic questions.

James did experience difficulty with the following Emerging Language functions: understanding and/or using prepositions, personal pronouns, plurals, possessive pronouns, and past tense. The following is a table showing each participant and their TECEL scores. Again, we were not interested in comparing the two participants but rather looking individually at each participant’s performance and progress.

| Insert Table 4 about here |

In all, based on the results of the TECEL, the BOT2, and the daily observations of the interdisciplinary team of professionals, we were able to track specific gains by both Carlos and James in four areas: (1) increased ability to follow two and three-step directions; (2) increased ability to express specific wants and needs orally with either or both of the communication devices; (3) increased ability to give their horses appropriate cues (i.e., increase in horsemanship skills); and (4) improved classroom behavior for several days following each therapeutic riding lesson.

Discussion and Implications for Practice

Though we cannot generalize our findings, we were able to assure a high degree of fidelity because our professional therapists and instructors were skilled in applying the same knowledge and techniques in a consistent manner over time. Any preconceptions the professionals might have about the two participants were mitigated because they did not know the participants – other than from the shared experience during their specific intervention. Random observers also indicated that the
therapeutic riding and hippotherapy sessions were consistently facilitated by the professionals leading the sessions.

Children on the autism spectrum use the same neural pathways and get the same neural stimulation as if they were walking when riding a horse because riding is a full-body experience. The horse’s gait mimics the human’s gait, and gives these children practice with walking as well. In addition, they can begin to gain an awareness – a sense – of how their behavior influences the horse’s behavior, which may be an important way to reach them. Individuals on the autism spectrum gain a special opportunity to participate in treatment while in a natural setting with horses, yet we imagine that few actually get to experience their treatment in such a unique way. Away from their daily indoor environment, they can experience safety in an open space with fresh air, surrounded by four-legged mammals who are as intrigued by the children as the children are by the horses.

Equines are large prey animals, and they pay attention differently. They are not judgmental and they really don’t care for humans’ social niceties. There is nothing sneaky or indirect about a horse’s communication – they are extremely authentic and honest. “Appropriate social behaviors” for a horse are very different than for a human, and ASD individuals seem to respond as a result. School-aged children and adolescents on the autism spectrum are pushed and prodded most of the time they are in school – pushed to change – to behave – and think in a way that is foreign to the ways in which their brains are structured and function.

We imagine these children rarely feel as if they have gained mastery over anything in the real world. Thus, therapeutic riding gives them an opportunity to gain skill and mastery over what a horse does. Imagine the satisfaction; in fact, in addition to sensing mastery bit by bit, the act of sitting on a horse – being taller than anyone around – might be part of the impact on how a child on the autism spectrum thinks and behaves during the therapeutic riding session, for this may be a unique perspective that only comes about once in a very long while.
How the changes to the DSM-V will impact individuals currently diagnosed with autism spectrum disorder and the services they require will remain to be seen as the new criteria goes into effect. Still, we believe more research needs to be conducted in the area of human-animal interaction, in particular, on the therapeutic use of equines with humans. We believe that our in-depth case studies of Carlos and James has added support to a growing evidence base for the use of equines in human treatment.

Our two, in-depth case studies suggest that Carlos’ and James’ lives and the lives of the people who care for them could benefit from adding therapeutic riding and/or hippotherapy to their special education classroom and recreation therapy, with or without dogs. We believe our study had a positive impact on the lives of Carlos and James in that their abilities to follow directions, ask for needs and wants, and their behaviors in class soon after treatment improved.

Certainly more research needs to be done. Strengthening study designs means increasing sample sizes, lengths of treatment, adding the use of wait-listed control groups, and using mixed methods with multiple measures. Our case studies support to the rationale for adding equine-assisted activities such as therapeutic riding and/or hippotherapy to existing therapies for persons diagnosed on the autism spectrum.
References


Huer, M.B., & Miller, L. (2011). *Test of Early Communication and Emerging Language*. Austin,


Table 1. BOT2 and TECEL Measurement Focus, Indicators and Statistics

<table>
<thead>
<tr>
<th>Specifics</th>
<th>BOT2</th>
<th>TECEL</th>
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</thead>
<tbody>
<tr>
<td><strong>Measurement Focus</strong></td>
<td><strong>Gross and Fine Motor Proficiency &amp; Performance</strong></td>
<td><strong>Early Communication &amp; Emerging Language Ability</strong></td>
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</tbody>
</table>
| **Measurement Indicators** | Fine Manual Control  
• Fine Motor Precision  
• Manual Coordination  
Manual Dexterity  
• Upper-Limb Coordination  
Body Coordination  
• Bilateral Coordination  
• Balance  
Strength and Agility  
• Running Speed & Agility  
• Strength | Chronological Age  
• Pre-test & Post-test  
Change in Age  
• Between Pre-test & Post-test  
Change in Percentile Rank  
• Between Pre-test & Post-test  
Age Equivalence  
• Pre-test & Post-test  
Change in Age Equivalent  
• Pre-test and Post-test  
Communicative Ability Index  
• Pre-test & Post-test (standardized)  
Change in Communicative Ability Index Score (standardized) |
| **Validity & Reliability** | • Strong correlations with construct validity (adj. r = .80) and internal structure via confirmatory factor analysis, plus concurrent validity with other standardized instruments (adj. r = .74).  
• Consistently moderately high degree of reliability related to internal consistency (.75); test-retest reliability at r = .78; interrater reliability at r = .98 for manual coordination, body coordination and strength and agility, and r = .92 for fine manual skills. | • Strong qualitative and quantitative evidence of validity, including high correlations with age and cognitive and language abilities.  
• A consistently high degree of reliability related to content (.94), time (.87), and scorer differences (.82). Little test error. |
## Table 2. Timeline of Study

<table>
<thead>
<tr>
<th></th>
<th>Once a Week</th>
<th>Once a Week</th>
<th>Eight Weeks</th>
<th>Once a Week</th>
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</thead>
<tbody>
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<td>Recreation Therapy</td>
<td>Recreation Therapy</td>
<td>No Therapy</td>
<td>Recreation Therapy</td>
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<td>Therapist Observation</td>
<td>Therapist Observation</td>
<td>No Observation</td>
<td>Therapist Observation</td>
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<td>Five Times a Week</td>
<td>Five Times a Week</td>
<td>Five Times a Week</td>
<td>No Observation</td>
<td>Five Times a Week</td>
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<td>Special Clinic Classroom</td>
<td>Special Clinic Classroom</td>
<td>No Classroom</td>
<td>Special Clinic Classroom</td>
<td></td>
</tr>
<tr>
<td>Classroom Observation</td>
<td>Classroom Observation</td>
<td>No Observation</td>
<td>Classroom Observation</td>
<td></td>
</tr>
<tr>
<td>October 6</td>
<td>November 10</td>
<td>December</td>
<td>January 11</td>
<td></td>
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<tr>
<td>Treatment Once a Week</td>
<td>10/6; 10/13; 10/20; 10/27</td>
<td>Treatment Once a Week</td>
<td>11/3; 11/10</td>
<td>Eight Weeks</td>
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<tr>
<td>Therapeutic Riding</td>
<td>Therapeutic Riding</td>
<td>Therapeutic Riding</td>
<td>No Riding</td>
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</tr>
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<td>Hippotherapy</td>
<td>Hippotherapy</td>
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<td>No Hippotherapy</td>
<td>Hippotherapy</td>
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<td>Once a Week</td>
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<td>Once a Week</td>
<td>Once a Week</td>
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<td>Standardized Instruments</td>
<td>BOT2</td>
<td>BOT2</td>
<td>No Measurement</td>
<td>BOT2 (1/11)</td>
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<td></td>
<td>TECEL</td>
<td>TECEL</td>
<td></td>
<td>TECEL</td>
</tr>
<tr>
<td>Interrater Observation</td>
<td>Interrater Observation</td>
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<td>Interrater Observation</td>
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Table 3. BOT 2 Scores for Carlos and James

<table>
<thead>
<tr>
<th>Participant Carlos Age Equivalence (AE)</th>
<th>Test Category and Subtests</th>
<th>Participant James Age Equivalence (AE)</th>
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<tbody>
<tr>
<td>&lt; 1%</td>
<td>Fine Manual Control Percentile Rank</td>
<td>5%</td>
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<tr>
<td>4.4 – 4.5</td>
<td>Fine Motor Precision</td>
<td>6.9 – 6.11</td>
</tr>
<tr>
<td>&lt; 4.0</td>
<td>Fine Motor Integration</td>
<td>9.3 – 9.5</td>
</tr>
<tr>
<td>&lt; 1%</td>
<td>Manual Coordination Percentile Rank</td>
<td>2%</td>
</tr>
<tr>
<td>4.2 – 4.3</td>
<td>Manual Dexterity</td>
<td>4.10 – 4.11</td>
</tr>
<tr>
<td>Unable to test</td>
<td>Upper-Limb Coordination</td>
<td>7.6 – 7.8</td>
</tr>
<tr>
<td>&lt; 1%</td>
<td>Body Coordination Percentile Rank</td>
<td>3%</td>
</tr>
<tr>
<td>&lt; 4.0</td>
<td>Bilateral Coordination</td>
<td>6.6 – 6.8</td>
</tr>
<tr>
<td>4.2 – 4.3</td>
<td>Balance</td>
<td>5.10 – 5.11</td>
</tr>
<tr>
<td>Unable to test</td>
<td>Strength and Agility Percentile Rank</td>
<td>16%</td>
</tr>
<tr>
<td>Unable to test</td>
<td>Running Speed and Agility</td>
<td>9.6 – 9.8</td>
</tr>
<tr>
<td>Unable to test</td>
<td>Strength</td>
<td>6.4 – 6.5</td>
</tr>
<tr>
<td>&lt; 4.5 years of age</td>
<td>OVERALL PERFORMANCE</td>
<td>4.10 – 10.0 years of age</td>
</tr>
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</table>
Table 4. TECEL Scores for Carlos and James

<table>
<thead>
<tr>
<th>Participant Carlos</th>
<th>Measure</th>
<th>Participant James</th>
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</thead>
<tbody>
<tr>
<td>12 years 6 months</td>
<td>Chronological Age (CA) Pre-test</td>
<td>12 years 8 months</td>
</tr>
<tr>
<td>12 years 9 months</td>
<td>Chronological Age (CA) Post-test</td>
<td>13 years 2 months</td>
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<tr>
<td>3 months</td>
<td>Change in Age between Pre- and Post-Test</td>
<td>6 months</td>
</tr>
<tr>
<td>59</td>
<td>Percentile Rank (PR) Pre-test</td>
<td>95</td>
</tr>
<tr>
<td>82</td>
<td>Percentile Rank (PR) Post-test</td>
<td>98</td>
</tr>
<tr>
<td>33</td>
<td>Change in Percentile Rank Score</td>
<td>3</td>
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<tr>
<td>11 to 11-15 months</td>
<td>Age Equivalent (AE) Pre-test</td>
<td>&lt; 24 – 30 months</td>
</tr>
<tr>
<td>18 to 18-30 months</td>
<td>Age Equivalent (AE) Post-test</td>
<td>&lt; 24 – 30 months</td>
</tr>
<tr>
<td>7 + months</td>
<td>Change in Age Equivalent Score</td>
<td>0 months</td>
</tr>
<tr>
<td>84</td>
<td>Communicative Ability Index (CAI) Pre-test (standardized score)</td>
<td>101</td>
</tr>
<tr>
<td>93</td>
<td>Communicative Ability Index (CAI) Post-test (standardized score)</td>
<td>108</td>
</tr>
<tr>
<td>9</td>
<td>Change in Communicative Ability Index Score</td>
<td>7</td>
</tr>
</tbody>
</table>
Figure 1. Characteristics of Participant Carlos

Age: 12 years 6 months (beginning of study) to 12 years 9 months (at end of study)
Ethnicity: Hispanic
Race: African-American
Diagnosis: DSM-IV Axis I – 299.00 Autistic Disorder; Mood Disorder; Mental Retardation; Trauma; Low Global Assessment of Functioning
History: Child abuse; foster care; adoption by single female; difficulty in school setting
Presents with: physically active; non-verbal; sad affect; violent to objects (not to people or animals); tires easily; loses focus; often walks bent-over
Services: Both individual and group speech-language therapy
Study Treatments: therapeutic riding – yes; hippotherapy – yes.

Figure 2. Characteristics of Participant James

Age: 12 years 8 months (beginning of study) to 12 years 11 months (at end of study)
Ethnicity: Non-Hispanic
Race: African-American
Diagnosis: DSM-IV Axis I – 299.00 Autistic Disorder; Mood Disorder; Mental Retardation; Trauma; Moderately Low Global Assessment of Functioning
History: Trauma due to natural disaster; homelessness; recent loss; difficulty in school setting
Presents with: very physically active; verbal – gibberish/jargon; playful; sense of humor; strong-willed; naturally likeable; willing to engage; fast learner; inquisitive
Services: Both individual and group speech-language therapy
Study Treatments: therapeutic riding – yes; hippotherapy
IMPACT OF EQUINE-ASSISTED THERAPY ON AUTISM

Picture 1. Getting ready for an equine-assisted therapy session

Picture 2. A typical equine-assisted therapy session begins

Picture 3. Nearing completion of an equine-assisted therapy session