

# ADHD Research on Exercise

## Implications for Therapeutic Horsemanship



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**L**isa Adams, program director at High Hopes Therapeutic Riding, Inc. a PATH Intl. Premier Accredited Center in Old Lyme, CT, recalls the progress of one of the center's participants who had been diagnosed with attention deficit/hyperactivity disorder (ADHD). This participant appeared high functioning but on closer observation showed difficulty with following commands, completing tasks, regulating impulsive behavior and learning the rhythm and timing of the trot. When she started the program, she required sidewalkers and a leader. However, as she learned to stay on task better and gained greater motor control, she progressed to becoming an independent rider.

While many people associate ADHD with behavioral and cognitive features such as inattentiveness, difficulty focusing and impulsiveness, motor problems frequently co-occur with ADHD. Unfortunately, these issues are often not identified or treated. The following review of the researched evidence suggests that certain types of exercise can play a role in controlling many of these symptoms. Although only one study showed that therapeutic riding improved behavior, quality of life and motor performance, the research suggests that activities participants work on in therapeutic horsemanship can play a role in strengthening behavioral, cognitive and physical functions impacted by ADHD.

◀ TOP: Research suggests that therapeutic horsemanship can play a role in strengthening behavioral, cognitive and physical functions impacted by ADHD. Photo courtesy of Riding to the Top Therapeutic Riding Center

BOTTOM: Unmounted exercises that can help children with ADHD improve fine motor skills include grooming and braiding. Photo courtesy of Hearts & Horses, Inc.



## ADHD and EAAT

Attention deficit and hyperactivity disorder (ADHD) is a common disorder affecting about 5 percent of children in most cultures.<sup>1</sup> For 30–50 percent of children, ADHD is a chronic disorder, and as adults, 2.5 percent still show symptoms.<sup>1,2</sup> The *Diagnostic and Statistical Manual of Mental Disorders 5th edition* (DSM 5) describes ADHD as exhibiting a persistent pattern of inattention, hyperactivity and/or impulsivity that interferes with development and functioning.<sup>1</sup> Symptoms must be present before age 12 and manifest in more than one setting, such as at home, in school with friends or during other activities. ADHD may present in three different ways. Children may have predominantly inattentive characteristics, predominantly hyperactive/impulsive symptoms or combined features of the first two.<sup>1</sup> ADHD is mostly diagnosed in boys; the incidence in boys versus girls is 2:1.<sup>1</sup>

It is very likely that a large number of participants in an equine-assisted activities and therapies (EAAT) program will have the additional diagnosis of ADHD in addition to their primary diagnosis. This is because almost 75 percent of children with ADHD have a second, so called comorbid disorder. The most common diagnoses simultaneously occurring with ADHD are oppositional defiant disorder, generalized anxiety disorder and mood disorders. The next co-occurring diagnoses with ADHD are learning disabilities, autism spectrum disorder, anti-social and personality disorders, conduct disorder, substance abuse disorder, obsessive-compulsive disorder and tic disorder.

## Purpose and Methods

The purpose of this study was to explore the literature on the use of exercise in relationship to both the behavioral and cognitive features and the motor symptoms and deficits of children with ADHD. First, the study looked at the type of exercise that may have the most potential to influence the symptoms of ADHD. Then it examined the role therapeutic horsemanship can play in addressing those deficits and strengthening children's functioning.

The articles that were included were published after January 2000. Participants were children and/or adolescents. Studies were excluded if exercise or physical activity was not an intervention, the subjects were adults, the subjects did not have ADHD or exercise was combined with another intervention. After review and analysis, only 27 articles qualified to be included. Research studies are also rated in level of evidence. Large studies with many participants and a rigorous control in bias are at the highest level of evidence. Studies with a few participants and lesser control measures, including fewer double blind controls (the majority), are ranked at the lowest levels.

# Trail Riding for ADHD

## Mental Health Benefits of Therapeutic Horsemanship

Years ago, when as a wrangler at Eaton's Ranch in Wolf, WY, one of my favorite duties was taking people of all ages out on various challenging trails and witnessing firsthand their increase in confidence, focus and self-esteem in a "nontherapeutic" environment. It was clear that trail riding helped people push through the immediate experience of fear toward increased competence. At this point I began strategizing on how to incorporate trail riding into my practice, beginning with a thorough review of the diagnostic criteria for anxiety and attention-deficit/hyperactivity disorder (ADHD). Out of this review I designed a program for treatment of anxiety and ADHD with an emphasis on trail riding, which includes an intern who assists in the group process.

The psychological, emotional and somatic benefits of this trail riding program are numerous. Guiding a horse requires one to be present in nature's bounty. The magical clip-clop motion along with the thorough engagement of the senses causes relaxation, awareness and presence. The mind becomes still and thus the body quiets down. The delicate relationship between the rider's physical being and the horse's momentum creates balance and focus on the physical sensations. This often translates to rapid growth in awareness and improvements in concentration in both home and school environments.

The two-hour children's group (up to six participants) is usually more intense than an individual session because it involves social interaction challenges. These include not listening to others, self-centeredness and difficulty setting and maintaining appropriate boundaries. The trail ride exposes a participant's weakness, fears or vulnerabilities in a group situation.

The trail riding program may be divided into four parts, each one building on the benefits of the previous: grooming, tacking, mounting/dismounting and riding. Grooming teaches and fosters preparation and organization, sequential learning, impulse control and delayed gratification. Its repetitive and tactile grounding nature helps regulate affect by physically slowing down and calming an anxious or hyperactive human. Grooming captures the attention and creates focus and, under guidance, requires task completion before moving on to the next step. Nurturing a horse through touch sets



A trail riding program that includes grooming and tacking can help participants with ADHD improve their concentration, focus, follow through and ability to delay gratification. Photo courtesy of All Star Equestrian Foundation, Inc.

the tone of the ride and the connection builds a sense of empowerment in the rider.

Tacking also supports a sense of empowerment. The task must be done thoroughly, in correct sequential order for safety reasons. Ten-year-old Carl, for instance, just wanted to rush through the tacking due to the impulsive nature of ADHD. The intervention with Carl has been to ask questions about his tack such as, "Why does the blanket go on before the saddle?" (for the horse's comfort.) Thus, through tacking, Carl learned the purpose and consequences of following directions.

Mounting and dismounting is another sequential exercise that requires skill, patience, listening and paying attention. It also requires impulse control to mount correctly.

Each group trail ride begins with a group check-in, which fosters bonding and connection. The assistant helps provide more individual attention, and everyone is encouraged to help each other along the way. Understanding horse herd behavior and safe trail behavior (e.g., keeping the correct distance between the horses) reinforces boundary issues.

The ride begins on a familiar yet appropriately challenging trail and offers unlimited opportunities for insight and growth. For example, riders must pay attention to the leader. They need to remain focused on their own body position, as well as their horse's position. Keeping the appropriate boundary between self and others requires remaining present with the task of staying on the trail.

The order of the horses is set in a manner that is most likely to foster an experience of individual competence and control. For example, horses are arranged according to how they get along. The anxious horses do better in the middle, while the braver ones are out in front. The riders are responsible for the cooperation of their horses and must always be aware of the boundary between horses. It is also useful to

pay attention to the trail "chatter" because riders often project what they may be feeling onto their horse.

Because horses have to be on the lookout for predators, sometimes even the most trustworthy horse may be freaked by a surprise in their line of sight. When a horse has a startle response it is useful to say something like, "Look how Caesar is looking at the log. What do you think he is thinking?" This type of intervention encourages an anxious child to relax (self-soothe) and to soothe his or her horse. It can also be used to teach about the nature of appropriate and unnecessary fear.

When Carl's horse trotted up a small incline to catch up, Carl asked why the horse responded that way. When asked, "What do you think?" this became a teachable moment in which Carl learned both to anticipate a horse's change in momentum as well as the importance of trusting his horse.

If a tree branch is intruding on the trail, we anticipate its coming, and then I demonstrate how to use leg to steer the horse around it. This teaches appropriate anticipation of obstacles and using proven methods to avoid them. It creates a balance between alertness and relaxation and teaches that the locus of control is within oneself, not external to self.

Riders learn that horses have impulses just like humans. When a horse, for instance stops along the trail and begins eating grass, the rider learns there is a time and a place for everything, but that this is not the time for grazing. This provides another teachable moment in delayed gratification, self-control and self-monitoring.

Both the anticipated incidents and the surprises on the trail can be metaphors for life and opportunities to negotiate life's challenges, to develop trust in letting the horse carry them safely and to find an inner place of attention and authority. Along the trail, riders work on paying attention and being highly present in a state of relaxation. They work on acknowledging their tasks and following through in appropriate sequence. Trail riding becomes a rich opportunity to address in the moment the many issues arising from ADHD and anxiety disorders.

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Most of the studies on ADHD and exercise focus on symptoms involving attention, mood, executive function and cognitive function. Attention is the ability to concentrate mentally. Mood is the state of mind or emotion. Executive function describes mental skills involving time management, planning and organizing and regulating impulse control. Cognitive function involves the comprehension of ideas, gaining knowledge and problem solving. A few studies reported that children with ADHD also have specific areas of motor challenges such as sensory-motor, fine motor and gross motor deficits. In addition, there are brain MRI studies of children with ADHD that support findings of motor impairments.

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## Brain Functioning and ADHD

Two meta-analyses of 32 studies show deficits in both the anatomical structure of the brain in children with ADHD and also the practical functioning of the brain in performing tasks. The two meta-analyses are considered the most rigorous in research construct. They encompass sample size, double blinding and randomized controlled trials. From these highest levels of evidence, impairments were found in the areas of:

- executive and cognitive function
- behavioral and mood regulation and emotional control
- motor coordination of both upper and lower extremities
- visual motor processing
- movements with visual challenge, selective attention and switching attention to objects.
- ability to select motor programs based on visual stimuli. (For instance, how do riders use leg aids and rein cues with the proper pressure to maneuver and position a horse so they can toss a ball in a hoop.)
- control of motor impulsivity
- processing special relationships. (For example, in jumping, where are the fences in relationship to each other so a sequence can be planned.)
- coordination of complex movements
- eye movements
- certain types of learning, memory and reward functions. These appear connected with reward behavior and emotional, cognitive, executive and empathic responses.

Therapeutic riding exercises that may strengthen these areas include walking or trotting over poles, riding figures, jumping and dressage, as well as challenging exercises in trot or canter with target practice. One can think of throwing a javelin through several hoops at a fast trot or canter or jumping several fences. Both involve identifying an obstacle, its location and switching focus between targets. These motor activities can also positively influence

cognition and emotion and affect learning and memory. In addition, EAAT provides an immediate reward for correct performance. Most importantly, it encourages participants to respond empathically to their horses.

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## Research Study Results

Five studies showed that children with ADHD had significantly poorer movement ability scores compared to controls. They looked at both gross motor function (running and jumping) and fine motor function involving sorting, cutting, beading and tracing. Children also had poorer balance on a balance beam and when hopping on one foot. Visual motor coordination during target practice, detection and switching was also worse in children with ADHD. No studies researched whether motor coordination training had a positive effect on symptoms. However, anecdotal reports suggest that therapeutic riding improves symptoms. Specific exercises might include trotting and cantering. More advanced maneuvers might involve pole riding, jumps, lead changes, figure riding, obstacle courses, balance exercises and games and target practice. Unmounted exercises could include vaulting, braiding, tacking, cleaning and reassembling tack.

Five studies showed that children with ADHD had clinically significant sensory motor deficits compared to controls. Sensory motor functioning is instrumental in cognitive functioning and academic achievement. Children who were assigned to sit on a therapy ball showed significant improvement in these areas compared to those who sat in chairs. Other exercise examples that improved functioning included sensory discrimination tests; visual motor integration; and vestibular, sensory, proprioceptive, auditory and tactile exercises. The implications for therapeutic riding could indicate balancing the body while sitting on a horse, balance games such as around-the-world, side-sitting, bareback riding, riding without stirrups and listening to the sounds of hoof beats. Unmounted exercises could include vaulting, brushing, bathing, clipping, combing and braiding.

Four studies showed that children with ADHD had deficits in rhythm coordination and timing compared to controls. This included motor coordination of activities such as rope jumping and tapping to a beat. Rhythm training, consisting of tapping both hands and feet to rhythmic sounds, improved scores in attention, motor skill, language, reading and aggression. Some examples of this would be rhythmic movements at different tempos, hand-foot coordination, use of beat or other auditory rhythm input and the use of a metronome. For therapeutic riding, this might mean learning to keep the beat to the trot and canter on a hard surface that provides auditory help. It might also involve encouraging the participant to voice and imitate each gait's rhythm and hoof beat and



▲ Pole riding, like many, therapeutic riding activities focuses on improving fine motor movement, balance, focus and executive functioning, in which many children with ADHD have deficits. Photo courtesy of Hearts & Horses, Inc.

pointing out differences such as the two-beat trot versus the three-beat canter.

Nine studies showed a positive effect of exercise on symptoms of attention, behavior, mood, executive functioning and cognitive functioning. These exercises included treadmill, running and sprinting games, physical activity/exercise two to three times a week, sports, personal training or gym. This suggests that frequency of riding two to three times a week would be helpful.

Two studies showed that leisurely walks in the park and common after-school and weekend activities in green outdoor settings, backyards, parks or farms had a positive effect on ADHD symptoms. This shows a lot of promise for EAAT as it is mostly outdoors, and it suggests that even leisurely trail rides may be beneficial.

## The Role of EAAT

Although there is enough evidence that indicates a beneficial relationship between exercise and the different symptoms of ADHD, more in-depth research is warranted. The type of exercise likely to be most effective for ADHD involves:

- complex sequences of both arms and legs
- fine motor activities with the hands
- balance and visual motor coordination practice
- rhythm and timing exercises
- activities that take place outdoors
- immediate reward for correct motor performance

One of the few physical activities that combines all these elements in one package is therapeutic horsemanship. Therapeutic riding, for instance, requires

the participant to learn and use complex sequences of both arms and legs in combination. It requires learning to balance on top of the horse, using vestibular, visual, proprioceptive, auditory and tactile information to maintain seat at all gaits. Fine motor adjustments with the hands and gross motor movements with the feet and legs need to be executed in coordination with each other. The rhythmic movement of the horse in walk, trot and canter facilitates learning timing and rhythm. Switching back and forth between rhythms enforces adjustments.

Participants choose the proper leg and rein aids and pressure (motor program selection) based on visual stimuli in order to control the direction of the horse. They then use visual-spatial attention skills to detect and properly negotiate targets. When going over poles on the ground, for instance, riders need to correctly gauge the distance between the poles. Then they must simultaneously apply the correct leg and rein cues and pressure to negotiate them at the walk, trot or canter.

When the correct motor program is chosen, participants experience a direct, instantaneous reward when the horse responds obediently. Unmounted EAAT activities, such as grooming, tacking and bonding with the horse and responding to the horse's feedback, offer additional practice in visual, sensory and motor coordination. All elements of reward, attention, empathy and affect, behavior, cognitive and executive function are involved and connected to a movement activity.

In the case of the High Hopes participant with ADHD, her lessons were paired with unmounted horsemanship lessons to focus on task completion and impulsive behavior. As she improved, she became an independent volunteer, helping out with grooming, tacking and care of the horses. Her parents reported improvement in her mood, behavior and organization after she had been at the barn. In the meantime, her motor skills progressed to the point where she learned to canter using the visual examples of other students cantering in the lesson. The student is now 15 years old and recently was accepted as a counselor in training for a 4H camp.

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