



Original Research

Horses Working in Therapeutic Riding Programs: Cortisol, Adrenocorticotrophic Hormone, Glucose, and Behavior Stress Indicators



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ABSTRACT

In order to determine horses' stress and ensure health and welfare of horses working with military veterans with posttraumatic stress disorder (PTSD) in a therapeutic horseback riding program, we measured the stress levels of the horses. Five horses worked in two 6-week therapeutic riding sessions: one 6-week session ridden by military veterans with PTSD (session 1) and one 6-week session ridden by experienced riders (session 2). Plasma adrenocorticotrophic hormone (ACTH), glucose, and cortisol levels were determined on a resting day (baseline [BL]) and in weeks 1, 3, and 6 before each riding class (T1), after tacking (T2), and after each riding class (T3). Behavioral patterns for stress were determined before venipuncture at the same intervals. In session 1, cortisol level at BL was significantly lower than at T1 and T3, whereas in session 2, it was significantly higher than at T1 and T3. Cortisol level in session 1 was significantly higher than session 2 at T1 and T3. No significant differences were found between two sessions or over time for ACTH. Glucose level at BL was significantly higher than at T3 in session 1 and higher than at T1 in session 2. Glucose level in session 1 was significantly higher than session 2 at T1, T2, and T3. Stress behavior scores were significantly lower in session 1 than session 2. Although physiological and behavioral patterns for stress varied across experimental conditions, they remained within normal reference ranges. There was no evidence that horses carrying riders with a disability were unduly stressed.

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1. Introduction

The equine industry in the United States is highly diverse and economically significant, with horses being used for diverse purposes. The industry encompasses an estimated 9.2 million horses and 4.6 million Americans, who are involved as owners, service providers, employees, and volunteers at equine facilities [1]. A majority of horses

(~70%) are used for showing or recreational purposes. An estimated 1.7 million horses are used for other purposes, including rodeos, farm work, or law enforcement [1]. In the United States and internationally, therapeutic horseback riding (THR) offers equine-assisted therapy to diverse populations. Approximately 6,300 horses globally work in therapeutic riding activities at over 850 centers, including 257 premier centers [2]. Premier therapeutic riding centers are certified upon achievement of specific accreditation requirements including “administrative, facility, program, and applicable special interest standards” [2]. These premier riding centers must satisfy basic standards for health and safety that ensure the well-being of horses and riding participants. However, it is well recognized that there are many riding centers not affiliated with the Professional Association of Therapeutic Horseback Riding International (PATH) also employing horses in therapeutic riding program.

A growing body of literature demonstrates beneficial outcomes of THR programs for people with developmental, physical, cognitive, and psychosocial disabilities including military veterans affected with posttraumatic stress disorder (PTSD) and/or traumatic brain injury (TBI) [3–5]. The interaction between horse and rider facilitates and encourages the development of riding skills, as well as feelings of confidence, patience, and self-esteem [4]. The equine gait provides neuromuscular stimulation that allows riders to develop greater strength, balance, coordination, and flexibility [6]. Additionally, physiologic arousal (e.g., stress neurochemicals) decreases in people and animals in response to human–animal interaction [7–9].

With continued growth in the number of horses used for therapeutic riding, it is imperative to consider horse stress levels to ensure both health and welfare of animals used. Two prior studies have assessed the impact of nontherapeutic riding styles on horses and have revealed that some types of riding can be stressful for horses [10,11]. Stress is associated with various detrimental health effects in horses. For example, horses that experience acute and chronic stress have modifications in their immune function [12] and are more prone to life-threatening diseases such as colic [13] and gastric ulcers [14]. A few studies have looked at the effect of THR programs on horses. The preceding study indicated that horses working in the program were not more stressed when they were ridden by physically or psychologically handicapped individuals than when they were ridden by recreational riders based on the ethogram of equine behaviors [15]. Cortisol concentrations were found to be significantly lower in horses used for THR sessions with disabled children rather than when they were ridden by recreational riders immediately after and for 30 minutes postsession [16]. This observation implies that horses working with disabled children were not stressed by their work. A study comparing hunt seat riding and therapeutic riding revealed no differences in salivary cortisol levels [17]. However, there is limited evidence demonstrating stress outcomes of the horses working with military veterans with PTSD and/or TBI. It is plausible that horses being ridden by people with severe physical and mental disabilities (e.g., military veterans affected with PTSD)

may be stressed due to the need to continuously adjust their own posture and gait to accommodate rigid and unyielding body posture of the rider. The horses may also be stressed by riders’ high anxiety and anger levels, low tolerance for, and reactivity to unexpected events.

Stress responses can be reliably assessed by demonstrating elevated cortisol concentrations [18–20]. In acute stress, serum-free cortisol increases within 10 minutes making it an excellent biomarker of physiologic responses to short-term stress [19]. The prior study revealed that horses ridden while jumping obstacles had a slight increase in cortisol levels but no significant difference in their stress levels related to the gender of the rider [21]. Blood glucose concentrations may also increase following an increase in serum cortisol because cortisol is inhibitory to the action of insulin [22,23]. Horses transported by trailer developed increased levels of glucose that were correlated with elevated serum cortisol [24].

Endogenous plasma adrenocorticotropic hormone (ACTH) concentration may also be measured as a biomarker of stress [25]. Adrenocorticotropic hormone is released into the circulation by corticotrophs in the pars distalis of the pituitary gland. Pituitary secretion of ACTH is triggered by corticotropin-releasing hormone from higher centers in the brain in response to stress [25]. Determination of plasma ACTH concentrations is also important for purpose of ruling out pituitary pars intermedia dysfunction (PPID), a very common comorbidity in older horses and ponies commonly employed at THR centers [26].

In addition to assessments of cortisol, ACTH, and glucose, earlier works identified and characterized reliable ethogram of equine behaviors as indicators of stress in horses. Equine stress behaviors include tail raising, pawing at the ground, repetitive oral movements, and pinning back of the ears [15,27]. Using these behavioral indices, results of a previous study showed that THR was no more stressful for horses when being ridden by physically or psychologically disabled individuals than by recreational riders [15].

Posttraumatic stress disorder is characterized by anxiety, emotional numbing, hypervigilance, reexperiencing of unpleasant situations (flashbacks), and muscle tension [28]. The muscle tension, spinal rigidity, and anxiety, with which military veterans are commonly affected, may exacerbate any existing stress that horses working in therapeutic riding centers experience. Posttraumatic stress disorders and TBI commonly occur together [29]. Traumatic brain injury is the conditions which physical portions of the brain are damaged, and the functioning is impaired as a result of a severe or moderate force to the head [30]. Traumatic brain injury sequelae include loss of consciousness or amnesia, change in cognitive functioning, and difficulties with memory. Additionally, many veterans are also affected by physical disabilities including paralysis of limbs, limb amputations, and other skeletal and muscular abnormalities that serve to alter their center of gravity and balance. These physical abnormalities may cause further stress for the horse because of the need to compensate for unusual load imbalances and instability in the rider (in addition to rider-associated tension) [31]. These factors may create an environment of uncertainty for the horse, thus making the horse’s work stressful.

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