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The Importance of Comparative Psychology in Equine-Assisted Activities and Therapies

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Practitioners of Equine Assisted Activities and Therapies (EAAT) use these therapies to help individuals suffering from a wide range of physical and psychological disorders as an alternative practice in physical and psychotherapy. Although there is plenty of research to support the benefits of these therapies, there is little research in equine behavior in this context, specifically how equine behaviors can best be utilized to improve the health of the human component. Although much of EAAT uses horses in physical therapy, newer practices in EAAT focus on assisting individuals in building and improving interpersonal skills through practicing those skills with horses. To fully understand and develop this area of EAAT, researchers need to look at the behavioral patterns of horses, how they learn and adapt to changes in human emotions and behaviors, and how these behaviors correspond to bonding within equine-human interactions. To do this, scientists need to rely upon the principles of learning theory and behavioral sciences associated with comparative psychology. The scientific methods used in comparative psychology provide a strong foundation from which to research these areas of EAAT.

There is plenty of research to support the physical and psychological benefits of Equine Assisted Activities and Therapies (EAAT), but little research into equine behavioral psychology or how different types of interactions can benefit both horse and human. A number of EAAT methods and models have been designed to provide physical and psychological therapies to individuals with physical and developmental disabilities as well as those with varying degrees of psychological disorders (Kendall, Maujean, Pepping, & Wright, 2014). These models, however, are focused primarily on the outcome of therapeutic practices for humans and fail to explore the elements of equine-human interactions that facilitate this outcome (Kieson & Abramson, 2016). Furthermore, the historic use of negative reinforcement as the primary means of training horses for transportation and work ignores the possible consequences on the subsequent human-horse relationship (Bierke, Meinen, Wilkens, Leponiemi, & Hiney, 2013; Cooper, 2007; McLean & Christensen, 2017; Murphy & Arkins, 2007b). Despite efforts to incorporate more positive reinforcement techniques during horse training (Craig, Varnon, Pollock, & Abramson, 2015; Ninomiya, Mitsumasu, Aoyama, & Kusunose, 2007), limited knowledge exists about how the horses perceive these hypothetically more socially-rewarding contexts. As a result, EAAT models rely on knowledge and practices based on historical training methods which depend on negative reinforcement with limited knowledge as to how to interact with horses in ways that mimic social bonding for both species.

As horses transition from the role of work and transportation into therapy and companion animals, researchers need to develop new ways humans can interact with these animals that facilitate the EAAT goals of interspecies social bonding. Most developed countries no longer rely on horses as a primary means of transportation or as work animals which corresponds to an increasing trend for people to view their horses as companions (Keaveney, 2008). This new role in society facilitated the transition to using equines in therapy and created the need to develop the new methods of interaction. Despite this transition, however, individuals still rely on traditional horse training techniques based on negative reinforcement (McLean & Christensen, 2017). This dependence on old techniques is due to a lack of research in interspecies social bonding within the

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horse-human dyad. For EAAT to achieve its goals of promoting trust, companionship, and interpersonal bonding through horsemanship, researchers need to study equine behavioral psychology in this context through the methods and concepts originating in comparative psychology.

Current State of EAAT

EAAT uses equine interactions as part of physical or psychological therapies for individuals suffering from a variety of disorders. Although riding is not always a component of EAAT, hippotherapy (the use of riding horses to produce bilateral rhythmic stimulation of the pelvis and back) can improve the health of various populations by reducing symptoms associated with muscular and skeletal disorders (Debuse, Gibb, & Chandler, 2009; Lechner, Kakebeeke, Hegemann, & Baumberger, 2007; Shurtleff, Standeven, & Engsberg, 2009). Similarly, mechanical versions of horses are associated with improved physical strength for elderly patients (De Araújo et al., 2013). Some popular models in EAAT include non-riding elements designed to provide psychological benefit to the client by focusing on behavioral interactions between human and horse (Kieson & Abramson, 2016; Latella & Abrams, 2015). These types of interactions have been shown to improve the mental health of individuals with autism, whether clients worked with the horse on the ground (Hameury et al., 2010) or while riding (Gabriels et al., 2012; Jenkins & Digennaro Reed, 2013). Additionally, EAAT has been shown to lower basal cortisol levels in young adults (Pendry, Smith, & Roeter, 2014). The physical benefits of EAAT and hippotherapy are well researched as are the psychological benefits to the participants. The actual behavioral interactions of the horse and the resulting welfare, however, are less understood.

In the context of EAAT, equine behavior is often used to convey meaning to the client or allow them to practice behavior, but very little attention is paid to the psychology of the horse. For example, horses in EAAT are used as a means to practice empathy, initiate conversation with the therapist, or develop compassion in the client (Kieson & Abramson, 2016). Since little little attention is paid to equine behavioral psychology, it is not uncommon for practitioners of EAAT to report wide variations in their interpretations of equine behavior. This misunderstanding of equine behavior and the appropriate learning theory application may be part of the reason why researchers have found that riding horses in therapeutic programs can often result in increased stress for the horse (Fazio, Medica, Cravana, & Ferlazzo, 2013). Furthermore, although most quantitative studies find similar results regarding benefits to clients, qualitative studies that focus on equine-human interactions often contradict one another with regards to interpreting equine behavior in the horse-human interaction (Pauw, 2000). For example, a unique three-year study in Kansas using 26 adolescents with moderate to severe behavioral disorders found little change in empathetic capabilities, self-esteem, or emotional control (Ewing, MacDonald, Taylor, & Bowers, 2007). Variations in individual interviews and differences in interpretations of equine behavior, however, suggests more research needs to be conducted into equine-human interactions and why EAAT works (Ewing et al., 2007). Both researchers and practitioners need to develop a better understanding of equine behavior in the horse-human interaction through promoting research in equine learning theory and its application in EAAT.

Research of Equine Behavior in EAAT

Despite a lack in research directly affecting the role of horses in EAAT, there is evidence to suggest that equine behavior and equine psychology are affected by human interaction. Most of the existing research in horse behavior in this context, however, is focused on stress responses and confusion behaviors. To study equine stress, researchers commonly use salivary cortisol, heart rate variability, behavioral indicators, and eye

temperatures to determine short-term stress responses of horses during human interaction (Borstel, Visser, & Hall, 2017). Horses, like other animals, exhibit stress behaviors as a response to both physical and psychological stresses which means it can be difficult for researchers and equitation (EAAT) practitioners to determine the cause of stress (Borstel et al., 2017). With regards to pleasurable response, there is some research to indicate that horses show positive voluntary responses to familiar humans with whom they have shared positive experiences (Sankey, Richard-Yris, Leroy, Henry, & Hausberger, 2010), but there is little evidence to suggest what, if any, behaviors indicate a social bonding between horse and human.

Considering that horses used in EAAT are used to practice empathy, compassion, and interpersonal bonding, this lack of knowledge is of primary concern within the industry. Research indicates that healthy interpersonal relationships are based on trust, dependability (consistency), feelings of safety and security, and positive interactions (Gambetta, 1990; Rempel, Holmes, & Zanna, 1985) with punishment negatively impacting close relationships between people (Vollan, 2011). Historically, horse-human interactions are primarily based on negative reinforcement and positive punishment (Bierke et al., 2013; Cooper, 2007; McGreevy, 2011; McLean & Christensen, 2017; Murphy & Arkins, 2007b). Consequently, EAAT practitioners and researchers need to find new ways to interact with horses that more closely resemble the positive reinforcement associated with healthy human relationships. Although there are positive reinforcement techniques available to train horses with food (Craig et al., 2015; Ninomiya et al., 2007), researchers have not explored how these techniques affect the horse-human bond.

In EAAT, humans rely upon the accurate interpretation of equine behavior to provide clients with a context in which to engage with the animal and explore how their actions affect others. Existing methods in EAAT utilize a variety of interactions with horses to achieve results for human benefit. Some of these methods involve leading or riding the horse, grooming, or using negative reinforcement to force the horse to move around a pen or over obstacles (Kieson & Abramson, 2016). In most of these models, the goal is to use the horse as a tool for therapy and, while EAAT practitioners claim to use the horse as a "therapeutic partner", the different models often focus primarily on the use of negative reinforcement and contradict one another as to their interpretations of equine behavior (Kieson & Abramson, 2016). For example, in Natural Lifemanship, the client is often asked to move a horse around a round pen by using negative reinforcement as a means of practicing control over the environment (or people). According to the model, the horse "bonds" with the human when it finally stops resisting the pressure (Kieson & Abramson, 2016). In contrast, the Professional Association of Therapeutic Horsemanship (PATH) emphasizes less pressure and more physical touch (such as grooming) to create a "bond" between horse and human, relying primarily on the relaxation of muscles and submissive behaviors to indicate horse "bonding" (Kieson & Abramson, 2016).

Although there are no standardized interpretations of equine behavior in EAAT, there is plenty of scientific and anecdotal evidence to suggest that changes in human behavior result in changes in equine behavior. For example, human vocalizations gets a horses' attention if a human is present and the horses show changes in behavior based on variations of vocal tone (Merkies, MacGregor, Ouimette, Bogart, & Miraglia, 2013). Furthermore, horses in pasture vary their reactions based on differences in human approach speed and behaviors (Birke et al., 2011). These studies support the idea that horses respond to observed changes in human behaviors, but there is also some evidence to suggest that horses may respond to human moods as well (Keeling, Jonare, & Lanneborn, 2009; Merkies et al., 2014). Considering the emotional and behavioral variations in individuals participating in EAAT, more research is needed to look at correlations between equine behaviors and different emotional or behavioral changes in humans.

The Horse-Human Bond and Practicing Interpersonal Relationships

To support the use of horses in EAAT for developing interpersonal and relationship skills, researchers need to look at how humans behaviorally bond and connect with other humans, how horses bond with other conspecifics, and how humans might use this knowledge to understand and study if or how horses might bond socially with humans. Researchers understand the behaviors humans and other primates use in social bonding, but there is no evidence to suggest these same behaviors can be used to bond with horses. Humans and primates, for example, use food as a social bonding tool (de Waal, 1989; Jaeggi, De Groot, Stevens, & Van Schaik, 2013; Koster & Leckie, 2014; Stirrat, Gumert, & Perrett, 2011) even correlating with oxytocin levels (Carter & Wilkinson, 2015). With regards to horses, however, researchers have so far focused on stress behaviors and cortisol response of horses resulting from human interactions (Dai et al., 2015; Mullard, Berger, Ellis, & Dyson, 2017; Wathan, Burrows, Waller, & McComb, 2015) with no known studies on how horses socially bond with humans.

Unlike traditional animals bred for companionship, previous studies in comparative psychology of cows and sheep demonstrates that, even with social interactions, herbivores do not display behavioral or neurological indicators indicative of interspecies bonding with humans. Although dogs demonstrate both behavioral and physiological indictors of social bonding with their owners (Berns, Brooks, & Spivak, 2015; Cook, Prichard, Spivak, & Berns, 2016; Konok, Nagy, & Miklósi, 2015), studies with lambs and cows show no obvious emotional bonds or connections with familiar humans, especially under stress conditions or potential opportunities for bonding (Coulon et al., 2013; Rushen, Munksgaard, Marnet, & DePassillé, 2001). There is evidence, however, to suggest conspecifics bond within herds of cows (Marino & Allen, 2017) and horses (Hartmann, Søndergaard, & Keeling, 2012) and additional support of interspecies social bonding in groups of mixed herbivores (Proops, Burden, & Osthaus, 2012). These studies suggest that domestic herbivores are capable of social bonding within and between species. Since EAAT focuses on using horses to practice interpersonal relationships, more research is needed to determine if horses socially bond with humans. Experiments conducted through comparative psychology and applied learning theory would help researchers and EAAT practitioners develop a better understanding of equine behavior in interspecies interactions and its applicability to EAAT.

Comparative Psychology and EAAT Research

By researching equine behavior and learning theory through the comparative method, researchers can help practitioners develop models of EAAT that mimic actual interspecies bonding that would facilitate their goals of paralleling interpersonal relationships in EAAT. This understanding would maintain and improve welfare of the horse, help individuals understand their own actions in the context of what is considered punishment versus negative reinforcement for establishing boundaries, and create an environment to practice trust, consistency, and positive reinforcement that are conducive to healthy human relationships (Gambetta, 1990; Rempel et al., 1985).

EAAT is based on behavioral interactions, not training, so researching positive interactions and interspecies bonding between horse and human is critical for the future of EAAT. Scientists already know that horses can be trained to perform tasks through the use of negative and positive reinforcement (Bierke et al., 2013; Briefer Freymond et al., 2014; Heidenreich, 2007; Hockenhull & Creighton, 2013; Innes & McBride, 2008; McGreevy, 2007; Slater & Dymond, 2011) and through the use of positive punishment (Hockenhull & Creighton, 2013). Only recently have researchers looked closely at the relationship between learning theory

and equitation and the overwhelming use of negative reinforcement and positive punishment with regards to how humans communicate with horses (Hockenhull & Creighton, 2013; McGreevy, 2007; McLean & Christensen, 2017; Murphy & Arkins, 2007a). These results suggest that researchers have accurately captured the nature of communication between humans and horses and the manipulation of horses for training purposes. It also suggests that scientists understand how horses learn with regards to human interactions in the context of reinforcement and punishment and the need to develop more ways to interact with horses through the use of positive reinforcement for use in EAAT.

Due to increased interest in animal-human interactions and animal-assisted therapies, researchers have begun to explore new perspectives into how animals perceive their human counterparts and the use of positive reinforcement. Much of this research, however, has been performed with dog-human interactions. Dogs have historically been linked to humans as both companions and work animals (Hoummady et al., 2016; McGreevy, Starling, Branson, Cobb, & Calnon, 2012; Pennisi, 2002; Vilà et al., 1997), but, unlike studies on horses, research on the dog-human connection and interspecies communication indicates a very close social relationship between dogs and their human counterparts. For example, canines tested in fMRI machines while awake and subsequently observed for behavior in a choice preference test demonstrated that they preferred human vocal praise over food rewards (Cook et al., 2016), suggesting that the social bond is stronger than food rewards. Another study found that when humans and their dogs made eye contact, there was a positive oxytocin feedback loop in both human and canine, suggesting a neurologically-based bonding association based on previous social connections (Nagasawa et al., 2015).

There are no such studies on horses, however, and, other than anecdotal evidence, there is little to indicate a strong social connection between horses and humans from the equine perspective. If horses are to be used as interpersonal connections, there needs to be significantly more research in this area to determine if they will remain as simple tools in this context, or if researchers can study and manipulate interspecies communication and bonding between horse and human to improve methods of EAAT. There is also some discourse in the scientific community to support an increase in involvement of comparative psychology as well as evolutionary psychology in order to improve the understanding of similarities between species and their interconnectivity (Vonk & Shackelford, 2015). This consideration is especially important due to an increasing interest in animal welfare and exploration into emotional states of domestic animals (Boissy & Erhard, 2014; Broom, 2010; Cory, 2013; Manteuffel, Langbein, & Puppe, 2009), and in this case relating to horse management and handling (Hall, Goodwin, Heleski, Randle, & Waran, 2008; Horseman, Buller, Mullan, & Whay, 2016; Sarrafchi & Blokhuis, 2013).

Researching the horse-human interaction has unique challenges, however, due to the size and cost of maintaining the animals. Although utilizing large sample sizes is common in science to study population parameters and make inferences to assumed populations (Preacher, Rucker, MacCallum, & Nicewander, 2005), such methods are rarely used when studying horse-human interactions since horses are large, expensive animals and necessitate smaller sample size. Creating a better understanding of equine behavior in human interactions is focused primarily on understanding the individual interactions so that more individualized models of EAAT based on client-horse interaction may be utilized.

Given the limitations of sample size and the goal of studying individual client-horse interactions, researchers should utilize scientific methods based in comparative psychology. Comparative psychology traditionally focuses on small sample sizes and behavior of individuals and small groups and utilizes experiments that elucidate behavioral patterns, such as the reinforcement requirements of horses during interactions with humans. Implementing comparative psychology-based designs will provide the basis for

better understanding of how horses perceive humans within the environment and if horses might choose to interact with humans in ways that parallel the behavioral conditions associated with human-human interactions.

Further Discussion

Unlike cows and lambs, horses were domesticated for close interaction with humans for use in transportation and work and, unlike dogs, did not and do not have a primary role as companion animals. As a result, there is a lot of research as to how horses have played a role in history and how they have learned from humans through negative reinforcement (Brubaker & Udell, 2016; Linklater, 2007; Sigurjónsdóttir, 2007). In contrast to their historical use, however, transitioning horses from work animals into therapy requires a more thorough understanding of this new horse-human interaction.

Since horses are expensive and each comes with unique breeding and experience, it can be difficult to isolate variables. Rather than approach research questions using parameter-based statistics, alternative methods may be better suited (i.e., Observation Oriented Modeling, which allows data to be analyzed for behavioral pattern analysis, comparison, and examining dyads within the context of the study or previous data). Although some population parameters may be applicable to human-horse interactions, especially those pertaining to species-specific behavioral reactions, the relationship between one human and one horse is especially difficult to study. Much like the experiments with dogs and their owners, each of these dyads is different and learning theories are critical to understanding how interspecies relationships between horse and human are formed and maintained. More research in horse behavior under rewarding conditions and how these behaviors might manifest in human interactions. Furthermore, researchers need to look at when horses voluntarily repeat behaviors on their own, with other conspecifics, and with humans to determine what constitutes a reward within each context. A more thorough evaluation of horse behavioral psychology, human-horse interactions, and the application of comparative psychology in EAAT can help improve not only the welfare of the horse, but the efficacy of the entire field of EAAT.

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