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Equine Science Center Research Updates

Horse and Human Responses to Equine Assisted Activities (EAA) for Veterans with Post-Traumatic Stress Disorder (PTSD)

Ph.D. student, Ellen Rankins, under the supervision of Dr. Karyn Malinowski (Equine Science Center, Rutgers University) and Dr. Kenneth H. McKeever (Department of Animal Science, Rutgers University), investigated the physiological and behavioral responses of horses during EAA sessions, psychological and physiological outcomes in veterans with PTSD, and the role of co-regulation in these processes.



The Research Project

Equine-assisted services (EAS) is a field of the equine industry that seeks to provide emotional, psychological, physical, and cognitive benefits to humans through interactions with horses. While there is much anecdotal evidence to support

the use of EAS, scientific literature is still scarce and very little is known about the well-being of horses in EAS. Additionally, very few studies have begun to explore the mechanisms at play in EAS sessions.



One of the horses in the study being outfitted with ECG electrodes and telemetric heart rate monitor prior to a session with a veteran. Heart rate was recorded throughout the sessions to provide information about the arousal level of horses and veterans.



A veteran participant wearing surface electromyography (sEMG) equipment which allowed muscle activity to be recorded during the sessions. These measurements were taken to investigate whether veterans or horses experienced muscular tension (stress) during the sessions.



The study nurse drawing a blood sample from one of the participants to facilitate analysis of plasma cortisol, oxytocin, epinephrine, and norepinephrine concentrations.

The objectives of this study were to 1) determine the effects of equine assisted activities (EAA) on measures of post-traumatic stress disorder (PTSD) and basal hormone concentrations in veterans; 2) determine the effects of EAA on horses' behavior and physiology; and 3) explore the role of co-regulation in EAA sessions.

PTSD symptoms (via standardized and validated self-report questionnaires) and plasma oxytocin, cortisol, epinephrine, and norepinephrine concentrations were measured before and after eight weeks of weekly EAA sessions in veterans who participated in EAA (EAA; $n = 6$) or were enrolled in a wait-listed control group (CON; $n = 3$).

Horse behavior and plasma oxytocin, cortisol, epinephrine, and norepinephrine were measured each week during the 30min sessions (EAA; $n = 6$). Each veteran worked with the same horse every week.

The same measurements were also taken in horses assigned to the control condition (CON; $n = 6$), which was confinement in a temporary stall placed within the arena where EAA sessions took place.

Plasma oxytocin, cortisol, norepinephrine, and epinephrine concentrations were measured in veterans in weeks 1, 4, and 8. Veterans also completed a human-animal interaction scale at the end of each session where they rated their interactions with the horse.

The EAA session consisted of the veterans learning and practicing horsemanship skills with their horses. Veterans were introduced to basic safety rules and received an overview of horse behavior and senses in the first week.

They learned to groom their horses and started each session with grooming. They then progressed through leading, liberty leading, and long-lining.

Changes in PTSD symptoms from the beginning to end of the study were significantly different in the EAA and CON groups with PTSD symptoms increasing in the CON group and decreasing in the EAA group. No changes

in basal oxytocin, cortisol, epinephrine, and norepinephrine concentrations were found.

Horses in the CON group displayed more stress-related behaviors and were rated as more anxious in qualitative behaviors assessment than horses engaged in EAA with the veterans.

Horses in the control group also had higher plasma cortisol concentrations by the end of each session while the EAA horses had no changes in plasma cortisol concentrations.

No differences or changes were found in plasma oxytocin, epinephrine, and norepinephrine concentrations.

The veterans' rated their interactions with the horses as more positive starting in week 3 and this change was sustained through the end of the eight weeks. There was a significant co-regulation coefficient between horse and human plasma epinephrine concentrations in week 8.

A significant co-regulation coefficient is indicative of synchrony between horse and human in the variable analyzed.

Conclusions and Future Directions:

Interactions with horses appears to be an effective intervention for addressing symptoms of PTSD as symptoms decreased in the group of veterans participating in EAA. These sessions had little to no deleterious effects on horses, with horses participating in EAA being less stressed than horses in the control group based on their behavior and plasma cortisol concentrations. The change in human-animal interaction scores is interesting and deserves further attention as these interactions form the basis of equine-assisted services. More positive interactions are likely to result in more positive outcomes for the horse and human participants.

The finding of a significant co-regulation coefficient is promising as co-regulation and the horse's ability to exert an influence over the human's physiological system and move towards synchrony may be a key component of EAS. Further work to explore the relationship between co-regulation and human outcomes is needed.



One of the veteran participants and the horse that he was paired with for the duration of the study enjoying a quiet moment together after their session. The participants enjoyed many such moments throughout the study.

Meet the Researchers

Dr. Ellen M. Rankins
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Ellen Rankins was a Ph.D. student in the Endocrinology and Animal Biosciences Graduate Program in the Department of Animal Sciences at Rutgers University. She received a Bachelor's Degree in Animal Sciences – Equine Science from Auburn University and then went on to complete a Master's of Science in Animal Science at the University of Florida under the supervision of Dr. Carissa Wickens. Dr. Rankins' background in 4-H and growing up on a diversified livestock operation in Alabama sparked her interest in horses and science, leading her to her current career path. This interest in horses was refined through her volunteer work at a local therapeutic riding center. This experience led her to pursue her instructor certification through the Professional Association of Horsemanship, International (PATH, Intl.) and research in the area of human-horse interactions.

Even with a common theme of human-horse interactions underlying her research, Dr. Rankins' research from undergraduate to graduate work has spanned a wide array of topics from biomechanics to behavior to physiology. Dr. Rankins started her dissertation research in 2021 investigating the effects of EAA on the human and horse participants. During her time at Rutgers University, Dr. Rankins has contributed to Equine Science 4 Kids! By presenting at various events and being the "voice" of Lord Nelson in his bi-weekly blog. She can also be found mentoring undergraduate students in their own research projects and contributing to other research studies being conducted at the Equine Exercise Physiology Laboratory. In her spare time, she continues to teach adaptive horseback riding lessons.

After defending her dissertation in July of 2023, Dr. Rankins took a postdoctoral research fellow position with the Temple Grandin Equine Center at Colorado State University. Her new position allows her to work with children with autism spectrum disorder and study the effects of integrating horses into occupational therapy on self-regulation outcomes for the youth. She is looking forward to starting a research project on the effects of the work on the horses in the near future.

Further Readings:

- Kinney, A. R., Eakman, A. M., Lassell, R., & Wood, W. (2019). Equine-assisted interventions for veterans with service-related health conditions: a systematic mapping review. *Military Medical Research*, 6(1). <https://doi.org/10.1186/s40779-019-0217-6>
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- Rankins, E. M., McKeever, K. H., & Malinowski, K. (2023). Equids in Equine Assisted Services: A Scoping Review. *Journal of Equine Veterinary Science*, 127, 104825. <https://doi.org/10.1016/j.jevs.2023.104825>

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