

THE EFFECTS OF EQUINE-ASSISTED PSYCHOTHERAPY ON STRESS OF
THE HORSE: MEASURING CORTISOL, PULSE, RESPIRATION, AND
BEHAVIORS BEFORE AND AFTER CLINICAL SESSIONS

A Report of a Senior Study

by

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ABSTRACT

Animal-assisted therapy has long been used as a technique in the counseling field. Equine-assisted therapy is now emerging as a relatively new tool in this field, and there have been studies showing the benefits from this therapy for people. This study investigated the effects of equine-assisted psychotherapy sessions on the horse by measuring pulse, respiration, cortisol, and behavior before and after sessions. The acute stress indicators (respiration and pulse) showed no significant difference in the before and after values for Spring, Summer, and Fall. The chronic stress indicator showed significant reductions in cortisol after sessions in Spring ($p = 0.004$), Summer ($p = 0.004$), but not Fall ($p = 0.732$). The conclusions of the study were the horses were less stressed after a session; repetitive or learned behavior exhibited during the sessions could be a plausible explanation of this finding. This is the first study to examine effect of therapeutic clinical sessions on equine stress, but as equine-assisted therapy continues to grow, so too will the investigations of it.

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CHAPTER 1

INTRODUCTION

Animal-assisted therapy (AAT) has long been used in the practices of many psychologists. One of the first scientific publications attributing successful treatment to an animal was in 1961 by Dr. Boris Levinson (Levinson and Mallon, 1997). He presented the paper at the American Psychological Association annual meeting, and his paper met with some negative review, many clinicians questioning his findings (Altschiller, 2011). But long before Dr. Levinson first coined the formal term “pet therapy,” animals were involved in the treatment of people. In 1792, the Society of Friends founded a mental asylum in England and used “animals to offer its patients an opportunity to peacefully interact with other creatures and focus on something outside of themselves” (Altschiller, 2011, 2). During the nineteenth century, Florence Nightingale, the famous British nurse, wrote *Notes on Nursing*, a book that strongly promoted animal companionship and the health benefits derived from it (Nightingale, 1898).

EQUINE-ASSISTED PSYCHOTHERAPY

Even though there is much research about AAT and its benefits, there has been little in equine-assisted learning and therapy (EAL/EAT), a field in which horses are utilized in therapeutic and learning interventions. The goal of these practices is to offer alternative therapeutic and learning opportunities through experiences with horses (Burgon, 2011). The

experiences with the horses provide a patient benefits, such as being non-judgmental and motivational. The horse is also a useful metaphor for building self esteem, confidence, and mastery; in fact, it has been claimed that animals in general can act as ‘communication mediators’ within the therapeutic environment (Burgon, 2011). The reason for this is because horses have many characteristics similar to humans and provide a mirror for the client to reflect in an environment that is safe (Schultz et al., 2007). Equine therapy has proven therapeutic in many situations; for example, children who have problems developing a relationship can benefit from EAT because the therapy is based on enhancing trust, communication, and guidance with the horse (Schultz et al., 2007). Horses also are effective for building trust and attachment with a therapist and other people, providing a calming effect, most notably during the initial sessions.

With the growing popularity of equine-assisted therapy methods, several organizations have been created, including the Equine-Facilitated Mental Health Association (EFHMA) and Equine-Assisted Growth and Learning Association (EAGALA); these associations strive to set standards for equine-assisted therapy, as well as bringing research and models into practice (Burgon, 2011). The standards vary depending on what styles of therapy are used, such as cognitive behavioral methods, psychoanalytic, psychotherapeutic person-centered and experiential gestalt approaches (Burgon, 2011). The EAGALA model allows for increased opportunities for creativity and flexibility for facilitating styles. The model focuses on the ground instead of on horseback and is solution-oriented, a belief that all clients, when given the opportunity, can discover their own solutions to their problems or issues. The EAGALA model uses a team approach, requiring an equine specialist, a mental health professional, and horses to work together with the clients in all sessions. The mental

health professional provides the structure for the sessions, the treatment plan of the client, and is also responsible for ensuring ethical practice. The mental health professional also builds on the Equine Specialist's observations of the horse behavior. The equine specialist is responsible for keeping the equine logs, documenting horse behaviors for each session, and staying aware of the safety of everyone present during a session (client, horse, and team). The equine specialist assists in structuring the sessions. This model offers flexibility to a session, allowing the team the opportunity to structure each session around the client.

STRESS

In domesticated animals, implications of stress can vary from an increase in heart rate to exacerbating an illness that can lead to death. Stress adversely affects production in food animals, such as cows, and behavior in companion animals (Boden, 2005). If not treated, stress can suppress immune function. This increases the possibility of infections and has also been shown to heighten susceptibility of cancer.

Stress focuses on aspects of an internal or external challenge, disturbance or stimuli. Physical stressors can be defined as external challenges to homeostasis, while physiological stressors can be defined as the body's response to anticipated challenges to homeostasis (Dhabhar, 2008). These stressors cause a response that result in the release of neurotransmitters and hormones in the body that serve as an alarm signal. Such responses can include an increase in stress hormone production, cardiovascular and respiratory system changes, and behavioral changes.

Hormonal Indicators

Cortisol, or hydrocortisone, is produced by the adrenal glands, located in the craniomedial region of each kidney, along with the rest of the glucocorticoids (Hart and

Barton, 2011). The synthesis of these hormones is regulated by the hypothalamic-pituitary adrenal axis (Hart and Barton, 2011), which can be seen in Figure 1.

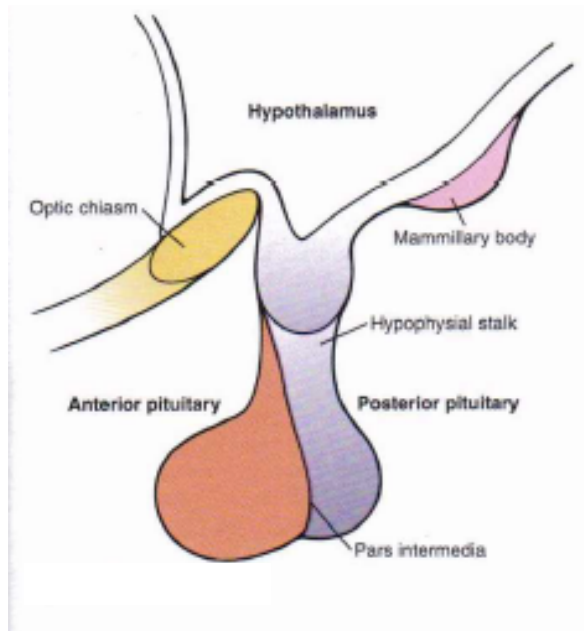


Figure 1: The Pituitary gland (Hall and Guyton, 2011, 895)

Physiologic, pathophysiological, or environmental stressors activate peripheral and central nervous system components. These signals are interpreted and integrated into the hypothalamus, activating the HPA axis (Hart and Barton, 2011). The corticotrophin-releasing peptide hormone is released upon activation of the HPA axis, causing corticotrophin hormone to be released. This hormone causes the adrenal glands to produce and release cortisol when they bind to the cell surface receptors on adrenocortical cells (Hart and Barton, 2011). Anterior pituitary gland functions and secretions can be seen in Figure 2.

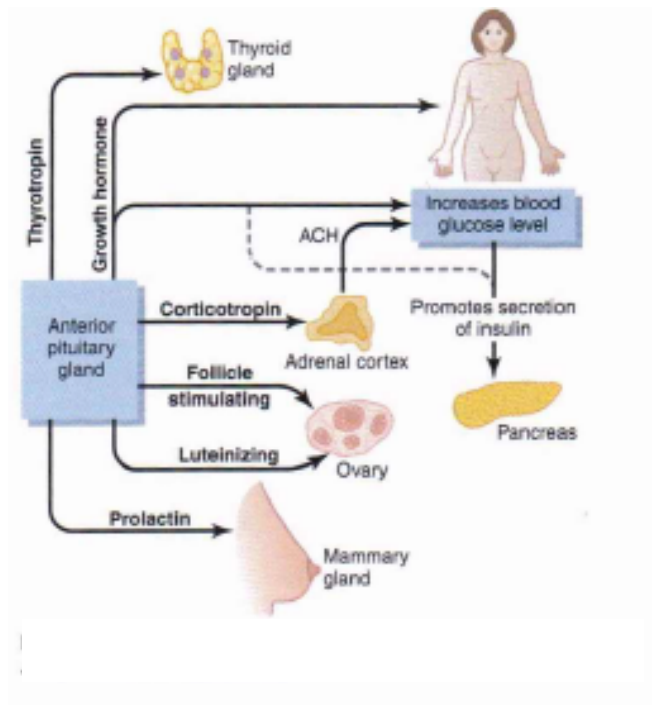


Figure 2: Anterior pituitary gland functions and secretions (Hall and Guyton, 2011, 895)

These hormones are important to the health of the body and help with the management of stress, whether physical or mental (Hall and Guyton, 2011). Chronic stress responses are mediated by glucocorticoids. Such responses have been incorporated into a general theory called general adaptation syndrome (Norris, 1997). There are three stages of this theory: alarm reaction, stage of resistance, and stage of exhaustion. The alarm reaction is characterized by an increase in sympathetic stimulation and increased secretion of glucocorticoids. The stage of resistance, also called the phase of adaptation, is characterized by prolonged, increased secretion of glucocorticoids. The stage of exhaustion is the last and final stage of this theory, and it leads to death because of the continuous presence of the stressful stimuli (Norris, 1997). In a recent study, blood analysis was done on race horses in order to test endurance and stress levels (Grosskopf and Van Resnburg, 1983). Measurements were made for hematological parameters such as blood glucose, hematocrit, red cell count,

and cortisol. The analyses showed increases in parameters like blood glucose and cortisol for horses that were ridden too fast. These results show that blood analysis testing parameters like cortisol can be used not only to measure stress but also to measure the endurance of race horses.

At rest, healthy adult horses have basal cortisol concentrations of 1.1-14.3 ug/dl or 30-395 nmol/L (Hart and Barton, 2011). Like other domestic animals, horses also show circadian rhythms in their cortisol secretions; in the mornings showing higher levels of cortisol than in the evenings. Changes in routine can cause stress, easily disrupting cortisol levels measured by blood analysis (Hart and Barton, 2011). This analysis can assist to quantify the level of stress in horses.

Cardiovascular and Respiratory Indicators

Cardiovascular and Respiratory systems are important when researching a variety of different conditions and situations. Measuring pulse and respiratory rate is a simple, quick, and non-invasive technique that is useful in both human and animal research. Heart rate variability (HRV) can be used to help diagnose and research cardiovascular diseases, diabetic autonomic dysfunction, and hypertension in people. HRV can also be used to diagnose stress and emotional states in farm animals, such as horses (Borell et al., 2007). The normal range of pulse in a horse is 30 to 44 beats per minute, and the normal range for respiration in a horse is 10 to 15 breaths per minute (VITAL SIGNS, 2009).

Behavioral Indicators

The use of behaviors as an indicator in stress can offer objective, immediate decisions for the welfare of animals. These are developed by focusing on the expression of behaviors in an animal thought to indicate stress. Often, physiological indicators are used with behavioral

indicators (Young et al., 2012). A benefit of using behavioral scores to assess stress is that it is non-invasive. Behaviors indicating stress in horses include shying away from touch, pinning ears, and stomping of feet. An important aspect to using behaviors to access stress is to be familiar with the animal, since there is no official guide or scale to quantify behavioral indicators for stress (Young et al., 2012). Some behaviors can be used to alleviate stress. Stereotypic behaviors are defined as repetitive behaviors induced by frustration. These are thought to be repeated attempts to cope with such frustrating environments (Furiex et al., 2013). These behaviors may include actions such as tossing of the head. As of yet, though, there has been no concrete scientific evidence that these behaviors alleviate stress in terms of adrenocortical activity (Furiex et. al., 2013). Still, the non-invasive technique and objectivity allowed by behavioral indicators make this a good method to access stress in animals.

Purpose of Study

The objective of equine-assisted psychotherapy is to assist the patient with the identification of feelings and attitudes. There are numerous studies about how EAT has had positive effects on the clients, including children who have experienced violence (Schultz, 2007), teens who are considered “at-risk” youth (Burgon, 2011), and families who have or are going through the grieving process. Evidence shows that therapy positively affects the patients and assists with the healing process. However, there are no studies evaluating the effect of EAT on the horse. One of the positive benefits of EAT on humans are the flexibility with the actual therapy session. A mental health professional may use one or multiple horses within a session, and session may include one person or a group of people. Although this may benefit the client, the ever-changing environment that the horse is subjected to may cause stress. The purpose of this study is to examine the effects of equine-assisted psychotherapy on horse stress level by measuring respiration, heart rate, cortisol levels, and behavioral changes before and after a therapy session.

CHAPTER 2

MATERIALS AND METHODS

Animals

This Study took place at Mane Support a non-profit organization located in Maryville, Tennessee. During the study, there were 10 horses on the property; 7 horses spent the majority of the time inside the barn, while 3 others spent all their time in the fields. In this study, 8 horses were used. Table 1 lists the horses' breed, age, and history/background.

Table 1: Personal Information of Horses at Mane Support. * indicates exact age is not known

Horse	Breed	Age	History/Background
Yank	Quarter Horse	15	Yank was a riding horse, but due to problems causing lameness, he is no longer a riding horse. He is a social horse and used in many of the sessions at Mane Support.
Charlie Brown	Thoroughbred	30	Charlie Brown is a retired show jumper and has arthritis. He is a gentle horse but was not used in this study due to his health problems.
Princess Bug	Welsh Pony	22	Princess Bug was a show pony. The behaviors exhibited suggest that she was abused at some point. She was used as a broodmare despite her COPD and atmsma. She is a shy horse.
Apple Jack	Pony	11*	Apple Jack was rescued from an abusive home and adopted by Mane Support from Horse Haven. He is a favorite at the barn due to his curious behavior.
Giddeon	Tennessee Walker	11	Giddeon was not used in this study due to his temperament problems.
Robbie	Check Quarter Horse	11	Robbie is a riding horse and exhibits very dominant behavior. He is a social horse.
Elvis	Tennessee Walker	4	Elvis is the youngest horse at the barn, and a social horse. He does not know boundaries, though, and tends to crowd clients looking for attention.
Chase	Thoroughbred	18	Not a lot of information is known about Chase. It is thought they he might have once raced. He was adopted by Mane Support and evidence suggests he was abused at his former home.
Skylar	Miniature Pony	12	Skylar is Dakota's brother. They were donated to Mane Support together. He is also a favorite at the barn due to his social and curious behavior.
Dakota	Miniature Pony	12	Dakota is Skylar's brother. They were donated to Mane Support together. He is a relaxed horse, but he can show sociable behavior a lot of the times.

Blood Collection

Countryside Veterinary Services collected the “before” blood samples at least 48 hours before the therapeutic sessions and the “after” blood samples immediately following the end of the sessions within 15 minutes. The blood was collected from the jugular vein. The Countryside Veterinary Lab Service centrifuged the blood samples. Plasma samples were frozen at -20° C until analysis.

Respiration

Respiratory rate was measured by visually observing the movement of the chest area. The “before” respiration was measured 15-20 minutes before sessions began. The “after” respiration was measured 15-20 minutes after sessions ended.

Pulse

Pulse was measured using a stethoscope on the horse’s left side, just under the elbow. The “before” pulse was measured 15-20 minutes before sessions began. The “after” pulse was measured 15-20 approximately 15 minutes after sessions ended.

Behavior

Behavior was observed during the session. An ethogram was used to characterize the behaviors seen in the sessions. The observations took place in 10-minute intervals with a 5-minute break in between each. Each time a behavior was observed, it was marked on the ethogram. Other behaviors that were not listed in the ethogram were noted during the session.

Table 2: Ethogram used to determine behavioral changes in horses before and after sessions:

PE	Pinning Ears; Ears moving from a vertical to a horizontal position along the head	
P	Pawing the Ground with hooves	
S	Stampeding; running towards an object without stopping	
T	Tossing the Head; rapidly making a nodding motion	
L	Lunging; rapidly moving head towards an object in an aggressive manner	
LC	Lunging and Making Contact with Human	
R	Refusing to Follow Command	
G	Grazing; feeding on the surrounding grass or hay	
B	Bucking; horse raising up on two posterior legs	
RE	Rotating Ears; ears moving in a circular motion	
RG	Rolling; horse rolls body in a 360° circle in a horizontal position	

Cortisol EIA

After the plasma samples were thawed at room temperature, a 100 ul aliquot of plasma sample and 5 mL of ethyl ether were added to 16x100 test tubes. After vortexing to ensure proper mixing, the plasma and ethyl ether mixture was flash frozen in a dry ice methanol bath. The supernatant was poured off into a smaller 12x75 test tube. Air was blown into the test tube to evaporate ethyl ether. The cortisol will be coating the tube. These steps were repeated a second time. This was done for all of the plasma samples.

The cortisol EIA assay was purchased from Cayman Chemical (Item No. 500360) and the assay protocol provided was followed. The bulk standard was prepared by diluting 100 ul of 400 ng/mL Cortisol EIA Standard with 900 ul of MilliQ water. To prepare the EIA standards, eight test tubes were obtained and numbered one through 8. Serial dilutions were made as followed:

1. Standard 1(4,000 pg/mL) was prepared by aliquoting 900 ul EIA Buffer and 100 ul of 40 ng/mL Bulk Standard.
2. Standard 2 (1,600 pg/mL) was prepared by aliquoting 600 ul of EIA Buffer and 400 ul of standard 1.
3. Standard 3 (640 pg/mL) was prepared by aliquoting 600 ul of EIA Buffer and 400 ul of standard 2.
4. Standard 4 (256 pg/mL) was prepared by aliquoting 600 ul of EIA Buffer and 400 ul of standard 3.
5. Standard 5 (102.4pg/mL) was prepared by aliquoting 600 ul of EIA Buffer and 400 ul of standard 4.

6. Standard 6 (41.0 pg/mL) was prepared by aliquoting 600 ul of EIA Buffer and 400 ul of standard 5.
7. Standard 7 (16.4 pg/mL) was prepared by aliquoting 600 ul of EIA Buffer and 400 ul of standard 6.
8. Standard 8 (6.6 pg/mL) was prepared by aliquoting 600 ul of EIA Buffer and 400 ul of standard 7.

The 100 dtn Cortisol AChE Tracer was reconstituted with 6 mL of EIA buffer. The 500 100 dtn Cortisol EIA Monoclonal Antibody was reconstituted with 6 mL of EIA buffer.

Statistical Analysis

The average respiration, pulse, and cortisol concentrations were calculated for the before and after samples. A paired t-test was performed to compare the before and after samples. A standard curve for the Cortisol EIA was constructed using the absorbance given by the Benchmark Microplate Reader using a 415nm filter and the standard concentrations.

CHAPTER 3

RESULTS

Respiration and Pulse

The average breaths per minute can be seen below in Figure 3 for Spring, Summer, and Fall seasons. The p-values comparing before and after averages for Spring, Summer, and Fall were 0.735, 1.00, and .200, respectively. The average beats per minute can be seen below in Figure 4 for Spring, Summer, and Fall seasons. The p-values comparing before and after averages for Summer and Fall were 1.00 and .200, respectively.

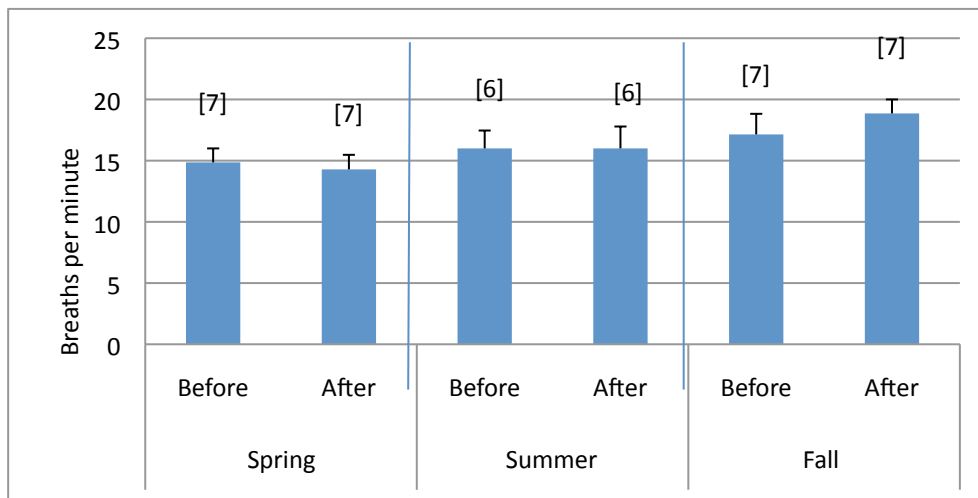


Figure 3: Average Respiration Rate Before and After a Clinical Session in Spring, Summer, and Fall Seasons: The average before and after respirations for Spring, Summer, and Fall with standard deviation shown.

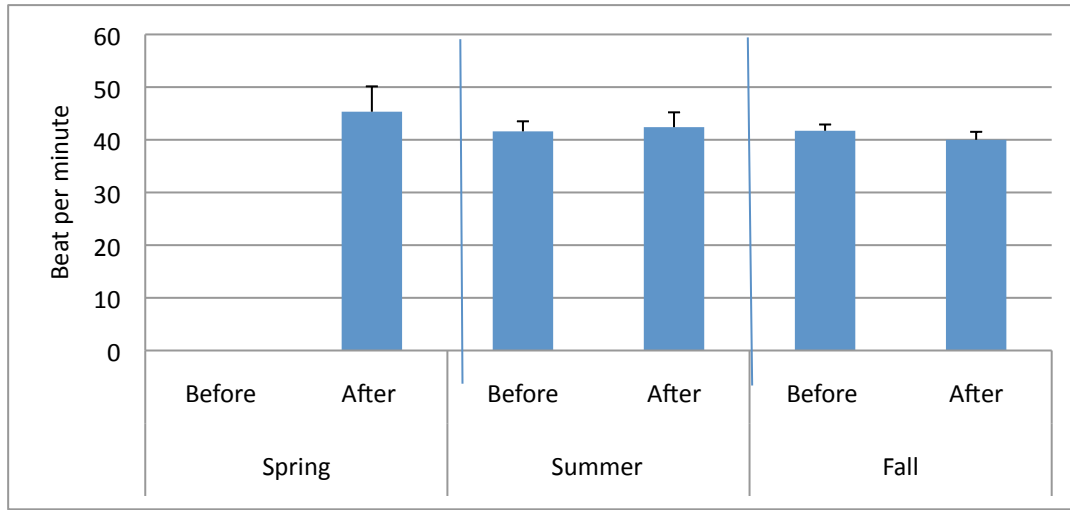


Figure 4: Average Pulse Before and After a Clinical Session in Spring and Summer

Seasons: The average before and after pulses for Spring, Summer, and Fall with standard deviation shown.

Behavior

Spring

Dakota would show jerky movements when the client would move quickly, but he quickly returned to his original position. He followed client around the arena when they would move. Skylar stayed away from clients but was watchful of them. He paced around the arena when he wasn't halted, and he stayed in the same place when the clients unhaltered him. He grazed while the clients were in the arena, but he would put his head up after eating a little hay to watch the clients' movements. Princess Bug would talk on the lead rope when halted. She would spin around when someone would stop behind her, but she stopped this behavior towards the end of the session. At one point, her ears appeared slightly pinned but she showed no sign of aggression towards the surrounding clients and horses. She had relaxed, drooping eyes at the end of the session. Apple Jack startled with swift movement from the client. He tugged on the lead rope when halted. He was interested in the clients,

coming close and smelling outstretched hands. He would shake his head occasionally. He also rolled while the session was occurring. Yank was watchful of the client, especially when the client was walking with other horses. Elvis was very sociable, and he came up to the fence to be close to the clients. Robbie showed the same behavior as Elvis. Chase stayed away from the fence where the clients were standing at the beginning. He became interested and came to the fence, but he walked away soon after. In Table 3, the percentage of behaviors, listed in the ethogram from Figure 1, exhibited by each horse during the clinical sessions can be seen. Grazing was excluded from these behaviors due to the fact that most horses grazed for a major portion of the session.

Summer

Yank seemed very relaxed, mainly just grazing on the surrounding hay. When client touched his flank, Yank stepped to the side slowly away from the client. He stayed still when the client was using a paint brush on his side. Apple Jack was interested in the clients, coming close and sniffing their outstretch hands. AJ allowed a young client to hug him without pulling away. He nibbled on the client's backpack while being lead across the arena. Princess Bug was almost constantly rotating her ears. She sniffed the clients, but would turn away on occasion. Skylar avoided being haltered at the beginning, but soon stopped and allowed the client to approach. He startled with quick movements, and he occasionally nibbled on the clients clothing. Dakota was interested in the client, coming close and smelling them, but he mainly grazed on the surrounding hay. In Table 4, the percentage of behaviors, listed in the ethogram from Figure 1, exhibited by each horse during the clinical sessions can be seen. Grazing was excluded from these behaviors due to the fact that most horses grazed for a major portion of the session.

Fall

Yank grazed the entire session. Apple Jack grazed most of the time, but he did show interest in the clients and stayed close to his stall door. Princess Bug stayed in the same approximate area when the clients approached and opened her stall door. She grazed when the clients were outside of her stall but stopped when they entered. She sniffed the clients' outstretched appendages, but she turned away after. Skylar allowed the clients to pet him without walking away. Dakota grazed most of the time, and he did not appear to be bothered by the family in the arena. Robbie came to the fence and allowed family to pet him, but soon moved away to graze. Elvis came to the gate and allowed the family to pet him, while grazing very little on the surrounding grass. . In Table 5, the percentage of behaviors, listed in the ethogram from Figure 1, exhibited by each horse during the clinical sessions can be seen. Grazing was excluded from these behaviors due to the fact that most horses grazed for a major portion of the session.

Table 3: Spring Behaviors during a Clinical Session: Percentage of behaviors exhibited by the horse during a clinical session.

Spring Horse	Rotating Ears	Refusing To Follow Command	Pinning Ears	Rolling	Pawing the Ground
Dakota	66.70%	33.30%	0%	0%	0%
Elvis	100%	0%	0%	0%	0%
Rob	100%	0%	0%	0%	0%
Chase	100%	0%	0%	0%	0%
Skylar	100%	0%	0%	0%	0%
Princess Bug	60%	20%	20%	0%	0%
Apple Jack	8.33%	75.00%	8.33%	8.33%	0%
Yank	66.70%	0%	0%	0%	33.33%

Table 4: **Summer Behaviors during a Clinical Session:** Percentage of behaviors exhibited by the horse during a clinical session. * Indicates almost constant rotation of Ears during the session.

Summer Horse	Rotating Ears	Refusing To Follow Command	Pinning Ears	Rolling	Pawing the Ground	Tossing Head
Dakota	100.00%	0.00%	0%	0%	0%	0%
Elvis	100%	0%	0%	0%	0%	0%
Skylar	50%	50%	0%	0%	0%	0%
Princess Bug	*	0%	0%	0%	0%	100%
Apple Jack	100.00%	0.00%	0.00%	0.00%	0%	0%
Yank	60.00%	0%	0%	0%	20.00%	20%

Table 5: **Fall Behaviors during a Clinical Session:** Percentage of behaviors exhibited by the horse during a clinical session.

Fall Horse	Rotating Ears	Refusing To Follow Command	Pinning Ears	Rolling	Pawing the Ground	Tossing Head
Dakota	100.00%	0.00%	0%	0%	0%	0%
Elvis	66.67%	0%	0%	0%	33.33%	0%
Skylar	100%	0%	0%	0%	0%	0%
Princess Bug	100%	0%	0%	0%	0%	0%
Apple Jack	100.00%	0.00%	0.00%	0.00%	0%	0%
Yank	100.00%	0%	0%	0%	0.00%	0%
Robbie	100%	0%	0%	0%	0%	0%

Cortisol EIA

The plasma samples were analyzed for cortisol concentration. The Standard Curve for the Cortisol EIA can be seen in Figure 5. The average cortisol concentrations for each season can be seen in Figure 6. The p-values comparing before and after averages for Spring, Summer, and Fall were 0.004, 0.004, and 0.732, respectively.

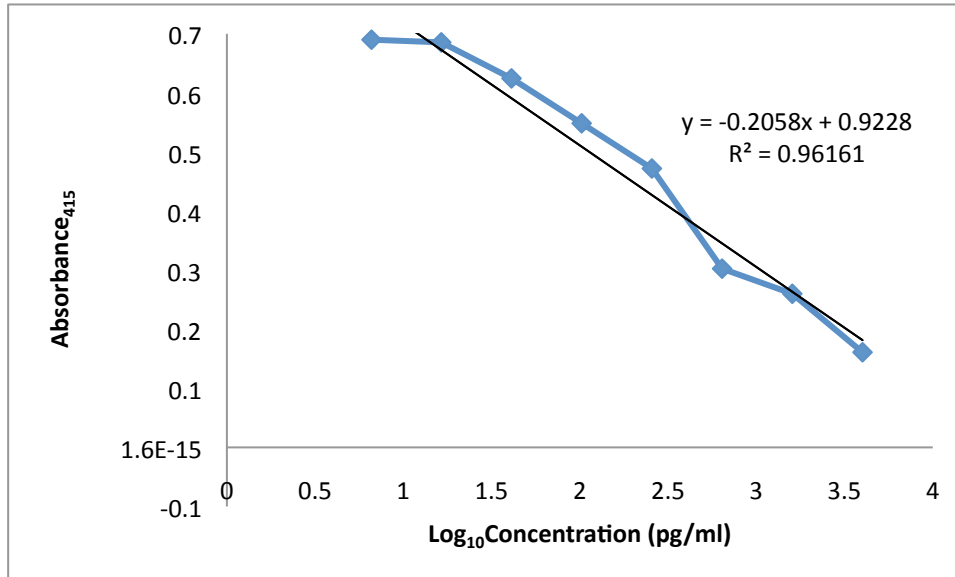


Figure 5: **Standard Curve for Cortisol EIA:** Standard Curve for Cortisol EIA (Cayman Kit: Item No. 500360) using Benchmark Reader at 415nm filter.

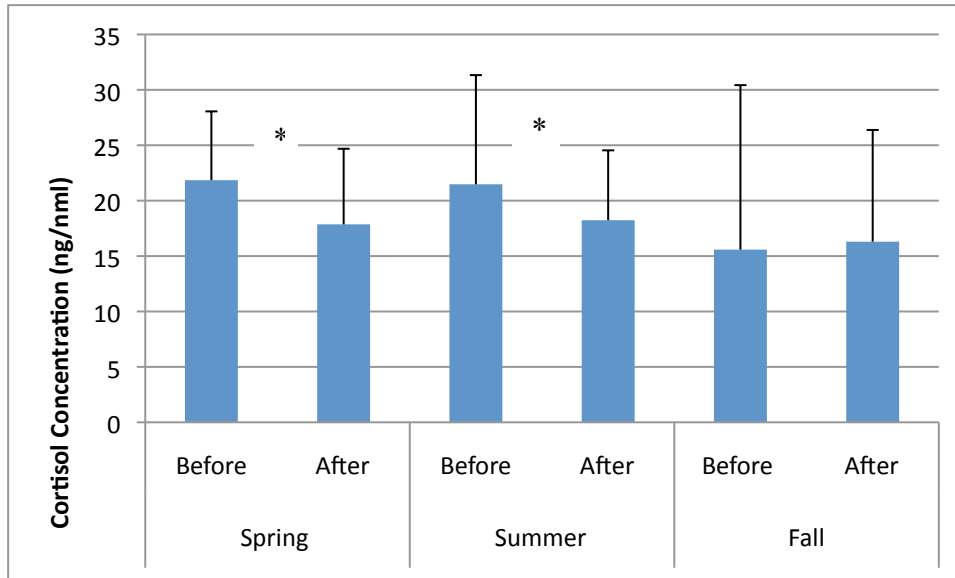


Figure 6: Average Cortisol Before and After a Clinical Session in Spring, Summer, and Fall Seasons: The average cortisol concentration (ng/mL) of the before and after samples for three seasons measured using Benchmark Reader at 415 nm filter with standard deviation shown. * indicates a significant difference ($p < 0.05$) in before and after values.

CHAPTER 4

DISCUSSION

This study investigated the effects of equine-assisted psychotherapy on the horse during clinical sessions at Mane Support. Pulse and respiration were measured before and after a clinical session to assess the acute stress levels of the horses. There was not a significant difference between the before and after values during Spring, Summer, or Fall seasons, suggesting that the horses were not acutely stressed during or after a session. Behavioral observations also suggested the lack of acute stress. However, cortisol levels (ng/mL) for Spring and Summer suggest there was a significant difference between the before and after cortisol measurements. The measurements showed an overall decrease in cortisol after sessions, suggesting the horses were less stressed after a clinical session. The Fall season did not show a significant difference in the before and after measurements. Horses in the Fall also had the lowest cortisol values, suggesting that the horses are less stressed overall in this season.

Many animals' cortisol levels are affected by season. Environmental stressors, including drought and extreme temperatures, either hot or cold, can impact the physiological systems of many species of birds and mammals, both humans and non-human primates (Gesquiere et al., 2008). A study investigating cortisol seasonality in female baboons

discovered higher cortisol concentrations in dry seasons than in wet seasons and higher cortisol concentrations in hotter months. The findings of heat stress in female baboons match other studies done in which animals showed higher levels of cortisol when exposed to extreme heat conditions (Gesquiere et al., 2008). It is important to know if an animal is experiencing increased cortisol levels. A chronic elevated cortisol level can cause major physiological problems, such as ongoing suppression of growth, reproduction and immune defense (Gesquiere et al., 2008).

Another factor to determine stress is behavior exhibited by the horse but this can be complex. In an experimental test on a large set of horses, researchers confirmed that behavior is affected by a mixture of both genetic and environmental factors (Hausberger et al. 2004). To reduce this variability, specific behaviors indicative of stress were measured during the clinical sessions. For example, the behavior of grazing suggests that a horse is not stressed. For many of the clinical sessions, the horses grazed on the surrounding grass or hay, indicating a low level of stress. None of the horses in a clinical session showed aggressive behavior, such as lunging or biting. This indicates a low stress level as well.

Heart rate is a physiological response that is often used to indicate stress in these studies. In a study investigating heart rate changes in horses being transported long distances, the researchers found that heart rate and cortisol levels did increase before and during transport (Schmidt et al., 2010). A study researching the effects of training before loading discovered that training reduces the stress levels of horses (Shanahan, 2003). This suggests that repetitive or learned behaviors can reduce the stress level of the horses. Another study investigating factors affecting plasma cortisol concentrations in horses found that a circadian rhythm occurred when some horses were accustomed to a specific routine, including stabling,

feeding and exercise. Some trained racehorses, for example, exhibit a circadian rhythm; this suggests that they have adapted to their surroundings (Irvine and Alexander, 1994). For this reason, it is important for cortisol levels to be tested at the same time of day to avoid any extraneous variables due to this rhythm. In this study, the horses blood was drawn at the same time each season (+/- 60 minutes). The overall decrease in cortisol levels suggested a decreased stress level after a session. Since these horses regularly participate in sessions, they could be accustomed to the environment and are therefore not going to be significantly stressed after a session.

This is the first study to examine effect of therapeutic clinical sessions on equine stress. The field of equine assisted psychotherapy is relatively new, and most of the research that has been conducted in this area is about the effects the clinical sessions have on people, not the animals. In a study investigating the efficacy of Equine-assisted counseling (EAC), over 100 students were identified as high risk for academic or social failure and participated in a 12 week study involving weekly counseling sessions. The pre- and post-treatment scores determined that students enrolled in EAC showed significant improvement in 17 behavioral areas, while students enrolled in classroom-based counseling only showed significant advancement in 5 areas (Trotter et al., 2008). These results showed the overwhelming success of this equine based counseling for people. Hopefully, more research focusing on the effects on the horse will occur in the future, helping to bring this emerging field even more success.

APPENDIX A

MARYVILLE COLLEGE INSTITUTIONAL ANIMAL CARE & USE COMMITTEE
Application for Use of Vertebrate Animals in Student Research

Provide information after each bold item

Student Name: Brittany Neff

Student Email Address: Brittany.neff@my.maryvillecollege.edu

Date:03/05/13

Senior Study Advisor: Dr. Crain

Species to be used: Horses

Age of animals: Various

Number of animals in study: 10

Duration of study: From April 17 – December 15, 2013

Location of animals during the study (building and room): Vera Acres Farm

List personnel to call if problems with animals develop:

Name	Daytime Phone	Nighttime Phone
Kim Henry	865-414-0557	865-380-1776
Brittany Neff	865-705-7038	865-995-2379

What will happen to the animals at the end of the study? If euthanasia is required, state the specific methods.

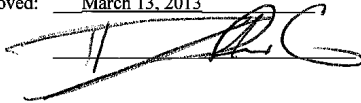
The animals will stay where they are housed now at Vera Acres Farm, the home of Mane Support.

(Do not write below line: For MC IACUC Use)

Maryville College IACUC Approval Number: 201306

Date Approved: March 13, 2013

Signed:



APPENDIX B:



Maryville College Institutional Review Board
OHRP IRB#: IRB00007383
FWA Assurance #: FWA00015150

Principal Researcher: Brittany Neff

Faculty Supervisor: Drew Crain

Division: Natural Sciences

Title: "The Effects of Equine-Assisted Psychotherapy on the Horse: Measuring Cortisol Levels, Blood Pressure, Pulse, Respiration, and Behavioral Differences Before and After Clinical Sessions"

Protocol# 03.04.13.02

Approval Status: Approved

April 3, 2013

Dear Brittany:

The Maryville College Institutional Review Board (IRB) has carefully considered your proposal referenced above. The proposed procedures afford reasonable protection to the human participants involved and therefore you are granted approval for the study.

Your approval is effective April 3, 2013 and will expire one year from this date. Thereafter, continued approval is contingent upon submission of a progress report that must be reviewed and approved prior to the expiration date.

Approval is contingent upon your agreement to obtain informed consent from your participants, to abide by the protocol summarized in the approved IRB application, and to keep appropriate records concerning your participants.

You are required to submit to the Maryville College IRB for review any changes in procedures involving human participants prior to the implementation of such changes.

If you have any questions concerning this approval or regulations governing human participant activities, please contact Dr. Crystal Colter, Chair of the Maryville College IRB, by e-mail at crystal.colter@maryvillecollege.edu or by phone at 865.981.8269.

Sincerely,

A handwritten signature in cursive script that reads "Crystal Colter".

Dr. Crystal Colter

Chair, Maryville College Institutional Review Board

502 E. Lamar Alexander Parkway, Maryville, Tennessee 37804-5907
Voice 865.981.8000 | Fax 865.981.8010 | maryvillecollege.edu

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