Equine temperament examination through novel object exposure: Suitability for equine-assisted activities and therapies

by
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A thesis presented to the Honors College of Middle Tennessee State University in partial fulfillment of the requirements for graduation from the University Honors College.

Fall 2017

Equine temperament examination through novel object exposure: Suitability for equine-assisted activities and therapies

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Abstract

Equine-assisted activities and therapies (EAAT) encompass a realm of programs designed to utilize the horse in a therapeutic capacity to help children and adults. It is important to have suitable horses for these programs, but there are no set tests to determine whether a particular mount is acceptable. Several methods were tested to see which was most suitable to determine the best horses to use for EAAT during novel object reactivity test using a mechanical cow training system (cowtracs), tarp, or fog machine. Heart rate data, live video observation, behaviorally defined adjective (BDA) scores were recorded and compared to an instructor suitability score sheet. Results suggest that the tarp reactivity test with heart rate data is the best indicators of suitability, while the cowtracs and fog machine proved to be less effective. It may be important to use reactivity objects that the horse may encounter during its use as a therapy animal.

Introduction

Equine-assisted activities and therapies (EAAT) are programs in which a person interacts with a horse to improve his or her mental and physical wellbeing. Some of the specific programs have activities such as riding, vaulting, and carriage driving. Such programs may beneficial to people with disabilities, to veterans, or simply to individuals looking to grow in a certain aspect of their life. A person with emotional problems can acquire a higher level of self-esteem and become more confident after handling a horse. People with physical limitations may strengthen their bodies through riding a horse. The relationship established with the horse creates a better quality of life for that individual, no matter their age (Professional; Learn, 2017).

Recently, an EAAT program was developed at Middle Tennessee State University within the Horse Science Program. This program, called the Center of Equine Recovery for Veterans (CERV) is a partnership with the Veterans Recovery Council of the U.S. Department of Veterans Affairs. The program pairs MTSU students and horses with veterans recovering from serious mental illness. In just a short period of time, this program has helped numerous veterans with life skills while also providing a learning opportunity for MTSU students.

Within the EAAT realm, the EAAT client is not the only one who must be cared for properly. The Professional Association of Therapeutic Horsemanship International (PATH) has standards for the care of any horses that are part of an EAAT program. “The member shall respect the integrity and well-being of program equines and animals whether owned, leased or borrowed” (Professional; Code, 2017). This includes being able to recognize that each horse has its own personal behavior characteristics, or

temperament. These specific traits will allow the horse to be placed in its proper niche in the program. Of course, not all horses will be accepted for the program. To choose a horse that is well suited for EAAT, looking at horse behavior is essential (Learn, 2017).

Horse behavior studies have become important in determining a horse's health and overall adaptability to its environment. Horse body movement, or lack of movement, is helpful in interpreting behavior (Houpt, 2011). One aspect of horse behavior is temperament. Lansade (2008) defines temperament as "a behavioural characteristic stable across situations and over time." Researchers have found multiple uses for temperament testing. These may be utilized to see whether a horse would be suitable for a therapeutic riding program (Anderson et al., 1999; Seaman et al., 2002), for breeding purposes (Seaman et al., 2002; Graf et al., 2014), or for police work (Seaman et al., 2002; Munsters et al., 2012). They can help test a horse for accident proneness (Seaman et al., 2002; Leiner and Fendt, 2011; Graf et al., 2014; Stucke et al., 2015), for the ability to travel safely (Schmidt et al., 2010), and for how easily it can be trained (Rivera et al., 2002; Seaman et al., 2002; Graf et al., 2014). They have also become a popular method of welfare assessment (Seaman et al., 2002; Ijichi et al., 2014; Bulens et al., 2015). What many researchers do not agree on is how to test the correlations of different behaviors.

Many tests incorporate a reactivity test in which the horse is startled by a stationary or mobile object. Some objects create sound, and other objects create physical and visual sensations. Some of these objects include balloons (Anderson et al., 1999), umbrellas (Anderson et al., 1999; Lansade et al., 2008; Leiner and Fendt, 2011; Bulens et al., 2015), balls (Borstel et al., 2011; Graf et al., 2014; Bulens et al., 2015), ground/floor coverings (Lansade et al., 2008; Borstel et al., 2011; Graf et al., 2014), cones (Lansade et

al., 2008; Bulens et al., 2015), tarps (McCall et al., 2006; Hanggi, 2010; Leiner and Fendt, 2011), smoke or fog machines (Munsters et al., 2012), and children's toys (Anderson et al., 1999; Seaman et al., 2002).

A few outcome variables that researchers have analyzed extensively are heart rate, heart rate variability (Rivera et al., 2002; McCall et al., 2006; Schmidt et al., 2010; Visser et al., 2010; Borstel et al., 2011; Leiner and Fendt, 2011; Munsters et al., 2012; Stucke et al., 2015), video observations of movement (Rivera et al., 2002; Visser et al., 2010; Nelson and Fijn, 2013), and stress hormones found in blood, saliva, or fecal matter (Anderson et al., 1999; Möstl and Palme, 2002; Rivera et al., 2002; Schmidt et al., 2010; Visser et al., 2010). Borstel (2011) used live observations of behavior to supplement video observations during the study.

Most of these have been successful. However, heart rate variability is more effective in horses at rest (Stucke et al., 2015). Heart rate is a good measurement to record simultaneously with physical behavior. Heart rate can show whether a horse is undergoing a stress response that is not visible in its physical behavior (McCall et al., 2006; Leiner and Fendt, 2011; Munsters et al., 2012). Behavioral observations of movement are also a good baseline for deciphering stress responses. For example, if a horse has a low heart rate and is showing signs of investigative behaviors like scenting and pushing the object with its nose, this indicates a horse that is calm with little to no signs of stress. However, if the horse is spooking when it gets close to the object and has a high heart rate, this suggests a high amount of stress (Visser et al., 2010).

Umbrellas, tarps, smoke machines, and traffic cones have been successfully used to see strong reactions from horses being tested. Bulens (2015) states that moving objects

would be a great way to heighten a horse's reaction to a novel object. Borstel (2011) confirmed that moving objects provide a strong visible reaction in horses. Lansade (2008) observed that the visible reaction increases with the intensity of movement. Color is also a factor that can influence a horse's reaction. In one study, the investigators chose the color blue because of previous research that proved horses would react strongly to a blue object (Graf et al., 2014).

Most horse personality questionnaires given to instructors and owners have been inconclusive in that the individuals cannot agree on the personality of the horse they are evaluating. Conversely, many studies using hormones as a measurement of stress had good results. Anderson (1999) came to a surprising conclusion during his study with therapeutic riding horses. Many of the horses in the therapeutic riding program had higher averages for both plasma cortisol and reactivity than horses not in the program. This counteracts the myth that all therapy horses chosen for an EAAT program are more desensitized to stimuli. Rather, horses that are in the middle of the reactivity scoring scale would be much more desirable horses for EAAT. Since the horses must also be able to cope in a therapeutic riding environment, it is recommended that a rider would make a test far more accurate (Borstel et al., 2011).

A fairly recent development is the use of personality adjectives to describe a certain pattern of behavior (Lloyd et al., 2007; Houpt, 2011). One test contains 30 Behaviorally Defined Adjectives (BDAs) placed into six categories: Anxiousness, Dominance, Excitability, Inquisitiveness, Protection, and Sociability. For each BDA, horses are ranked from one to seven, with one meaning the horse showed no expression of the adjective and seven meaning the horse showed full expression of the adjective.

Some consideration has also been given to the human psychology "big five": openness, conscientiousness, extraversion, agreeableness, and neuroticism (Borstel et al., 2011). However, agreeableness and openness were found to be difficult to assign to horses (Lloyd et al., 2007).

One problem for researchers is the existence of too many variables. Some concerns that have been noted during testing include differences in breed (Anderson et al., 1999; Lloyd et al., 2008; Graf et al., 2014), sex (Graf et al., 2014), and age (Visser et al., 2010; Graf et al., 2014; Bulens et al., 2015). Researchers need to be aware that these three differences may inhibit comparisons with their own study (Anderson et al., 1999).

Restraint of the horse is addressed by Stucke (2015), who states that prolonged restraint can lead to an increase in stress levels, which can lead to biased results. Similarly, a topic that is still debated is whether a rider of handler should be present during any temperament testing. Borstel (2011) emphasizes that any extraneous variables like these need to be removed from the study completely. Even though these experiments have different methods of conducting a temperament test, Seaman (2002) and Graf (2014) argue that the need for a simple, cheap, effective temperament test, novel object test and startle test would be a significant breakthrough in the horse industry.

There is a fair amount of research on horse behavior and temperament. However, there is not much research on how to discern whether temperament can be used to predict whether a horse would be suitable for more than one discipline (Anderson et al., 1999). Horses utilized in the MTSU CERV program are used for both traditional riding courses and lessons as well as the EAAT program. Currently, horses are selected for CERV by instructors after observation of extensive traditional use in riding courses. However,

development of a prediction tool to determine a horse's suitability for CERV or a similar program in a short amount of time would prove quite useful.

The purpose of this study then is to compare three reactivity tests to traditional evaluation by an EAAT instructor for determining suitability for use in an EAAT program. This study will be conducted using three novel objects: a cowtracs brand mechanical cow system (referred herein as "cowtracs"), a fog machine, and a tarp with rope. The cowtracs will be used because the horses chosen for this project are utilized exclusively in hunter seat riding and have not come into contact with the equipment before (despite its use with stock type horses in our program). The BDA categories that will be evaluated are Anxiousness, Excitability, and Inquisitiveness.

Thesis Statement

Exposing a horse to novel objects that are not used in the horse's primary riding discipline, while measuring heart rate and behavioral response, is an effective way to test whether a horse's temperament makes it suitable for use as a therapeutic riding mount.

Methods

Animal Care and Use: The proposal was submitted and approved by the Institutional Animal Care and Use Committee (IACUC) of Middle Tennessee State University (MTSU).

Horses: For the duration of this study, 6 horses from the MTSU Horse Science Center (HSC) were used. Horses selected were ones who were normally used for hunter seat riding only within the MTSU program. The horses were randomly selected from that pool by a Horse Science faculty member. Each horse was led into the arena and then released by the handler (Spooner) for all object tests. For each test, the horse was turned loose in the arena or round pen for a total time of 8 minutes. Once the 8 minutes were complete, the handler retrieved the horse to be taken back to its stall for a minimum resting period of 15 minutes between tests.

Measurements/Data: Heart rate data was collected throughout reactivity testing using an equine heart rate monitor (Polar RC3 GPS, Polar Electro Inc., Lake Success, NY) placed on the girth.

Behavior was recorded on video and scored with live observations. As habituation can affect behavior research results (Seaman et al., 2002; Lansade and Bouissou, 2008; Schmidt et al., 2010; Leiner and Fendt, 2011), researchers randomly selected the horses order and the order of the tests were balanced for cross-over effects.

For behavior, the researchers analyzed three out of the six major components from the HPQ (Lloyd et al., 2008). Anxiousness was described as fearfulness toward the object, Excitability was described as the level of activity (both positive and negative) expressed when exposed to object, and Inquisitiveness was described as the level of

interest in the object. Each BDA was ranked on a reactivity scale of 1 to 5. One represented no expression of that component, while 5 was full expression of that component utilizing a score sheet (Appendix B). The Horse Science faculty member (Spooner) assigned these rankings throughout the course of the tests. Dr. Spooner has a PhD in Animal Science and more than 15 years of experience in behavior and training of horses and has previously evaluated horses for EAAT suitability.

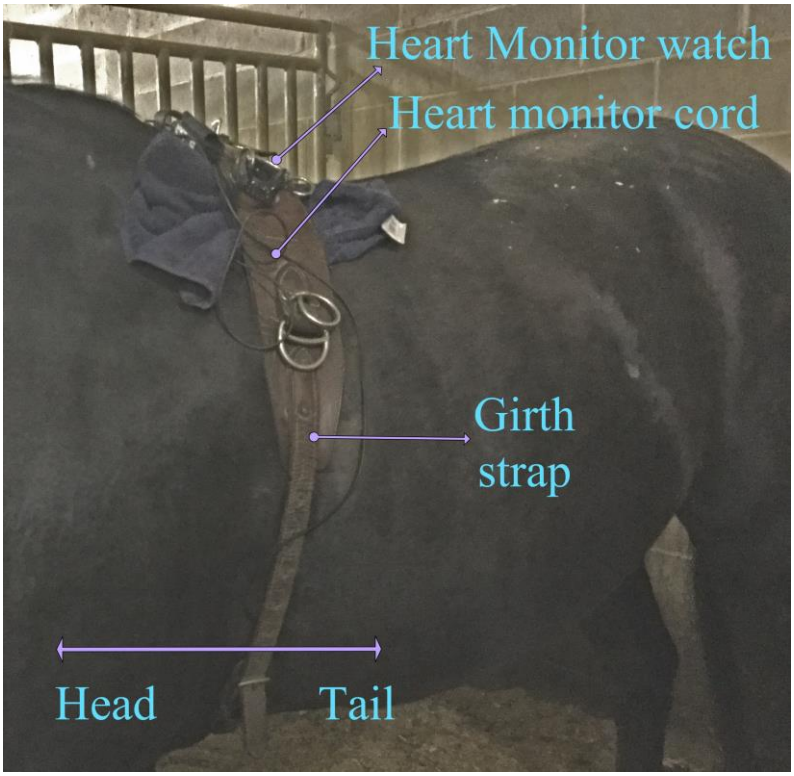

Fig 1. General set up of a heart rate monitor for collecting heart rate data.

Cowtracs (object 1; Test A): This test was done in the large indoor arena. The cowtracs (CowTracII, Cowtrac™ Systems, Scotts Valley, CA) was hooked along the farthest side of the arena from the entrance. The horse was in the arena for 2 minutes, then the cowtracs was turned on (moved back and forth along an approximately 30.5 m distance) for 1 minute. Once turned off again, it was stationary for 2 minutes before being turned on again for 1 minute. The final 2 minutes, the researchers again turned off the cowtracs.

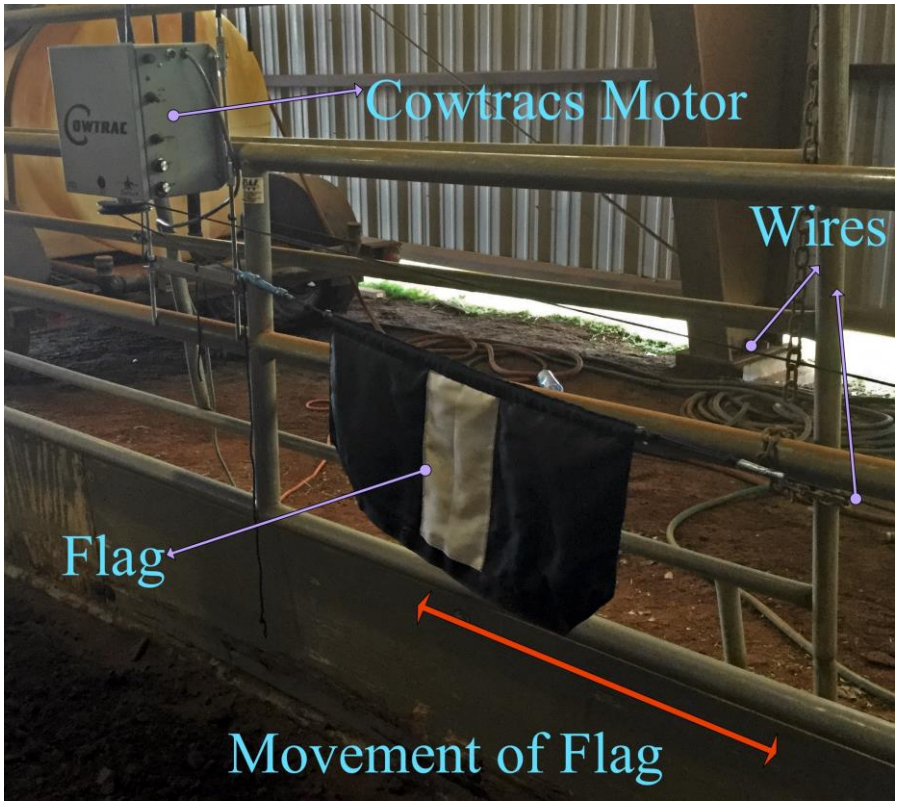

Fig 2. Image of the cowtracs system (CowTracII, Cowtrac™ Systems, Scotts Valley, CA) set up in the indoor arena of the MTSU Horse Science Center. The system stretched about 30.5 m across the arena wall furthest from the entrance.

Tarp hooked with rope (object 2; Test B) and Fog machine (object 3; Test C):

These tests were done in two outdoor round pens. The tarp (5mx5m) was hooked over the side of the smaller pen with a blue lunge line. It was on the side of the pen farthest from the entrance. The fog machine (Amscan Inc., Elmsford, NY), was placed to the left of the entrance to the larger round pen. The timeline of these tests was equivalent to that of the cowtracs in regard to timing.

Fig 3. Tarp setup in the outdoor round pen of the MTSU Horse Science Center. From the door, the tarp was on the opposite side of the pen. The tarp was pulled up no more than 1.8 m and then allowed to fall in a repetitive motion for one minute.

Fig 4. Fog machine setup in a round pen at the MTSU Horse Science Center. Fog machine was inside the arena placed next to the entrance.

At the conclusion of the test, each horse was returned to its stall. "Recovery" heart rate was recorded for a 10 min period. All tests were separated by a period of at least 30 min to allow heart rate to return to baseline.

Heart rate data and behavioral scores were compared to a pre-determined EAAT suitability assessment provided by MTSU EAAT instructor Andrea Rego, who has familiarity with all subject horses. Miss Rego has a MS in Horse Science and has served as an EAAT instructor, including evaluating horses for suitability, for 2 years. Horses were ranked from 1 to 5 with 1 being the least suitable and 5 being the most suitable. Correlations were determined between tests (including both BDAs and heart rate data) and behavioral scores to determine the most suitable test.

Results

For each horse, the total testing time was around 114 minutes (1hour and 54 minutes). This time includes all three required rest periods of 30 minutes each. The total time varied slightly between horses due to heart rate monitor issues and the time it took to put the heart rate monitor back on the horse.

In figure 5, highest heart rate values were compared for each individual reactivity test. The tarp test had the highest heart rate recorded for both spook minutes, while the cowtracs had the lowest max heart rates. From the first spook minute to the second spook minute, max heart rates went down numerically for all tests, but was statistically unchanged.

In figure 6, the highest overall heart rate (maxHR) was compared for each test. The tarp has the highest max heart rate (158.8±13.91; $p < 0.0001$), and the cowtracs had the lowest max heart rate (111.5±13.28; $p < 0.0001$). The fog machine was intermediate (142.17±13.28; $p < 0.0001$).

In Table 1, the average scores for Anxiousness, Excitability, and Inquisitiveness are listed. The tarp test has the highest scores for all three BDAs while the cowtracs had the lowest scores for all three BDAs, while fog was intermediate. Average suitability as determined by an EAAT instructor was 2.67 out of 5 with a range of one to five for the horses presented, with 5 being most suited for the program.

In figure 7, strides taken by each horse are compared between tests, and between the first and second spook minutes. The tarp test had the highest number of strides for both spook minutes and the cowtracs had the smallest number of strides for both spook

minutes, with fog intermediate. For all tests, strides taken were not statistically different between the first and second spook minutes.

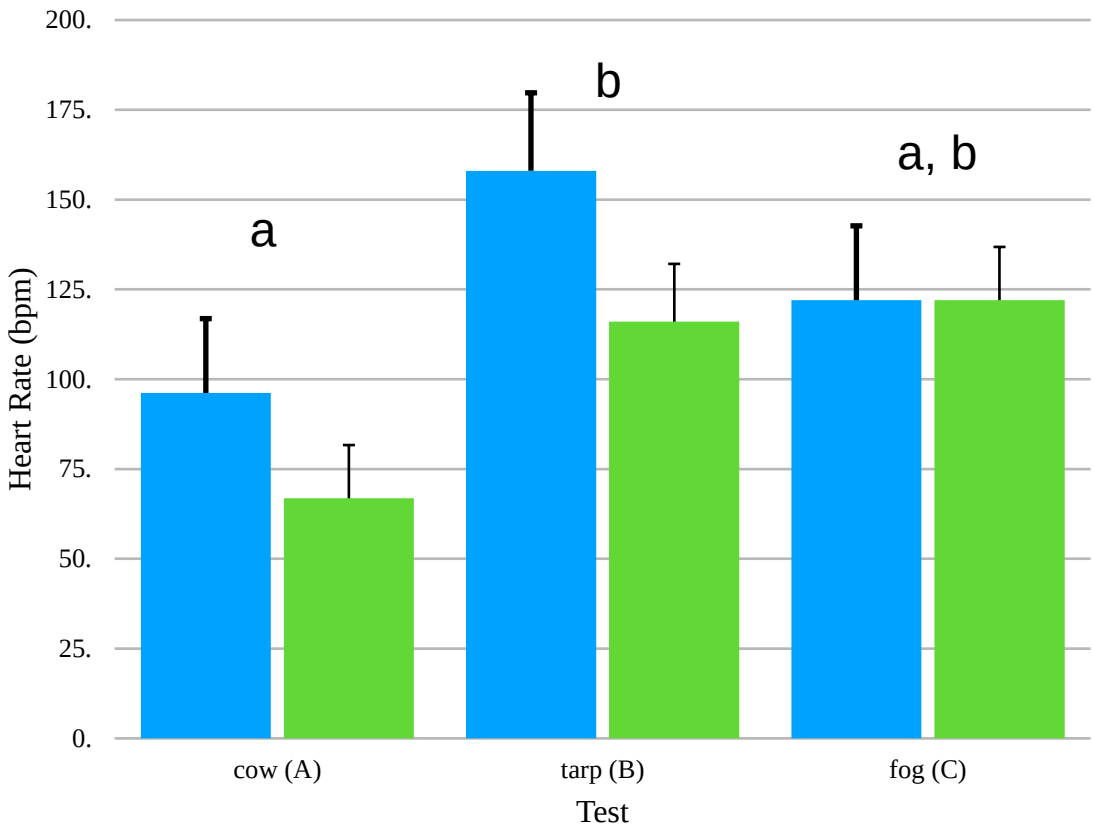

Fig. 5. Comparison of max heart rate between the first spook minute and the second spook minute for the cowtracs, tarp, and fog machine utilized to help determine EAAT suitability. Tests not sharing a common superscript differ ($p < 0.05$).

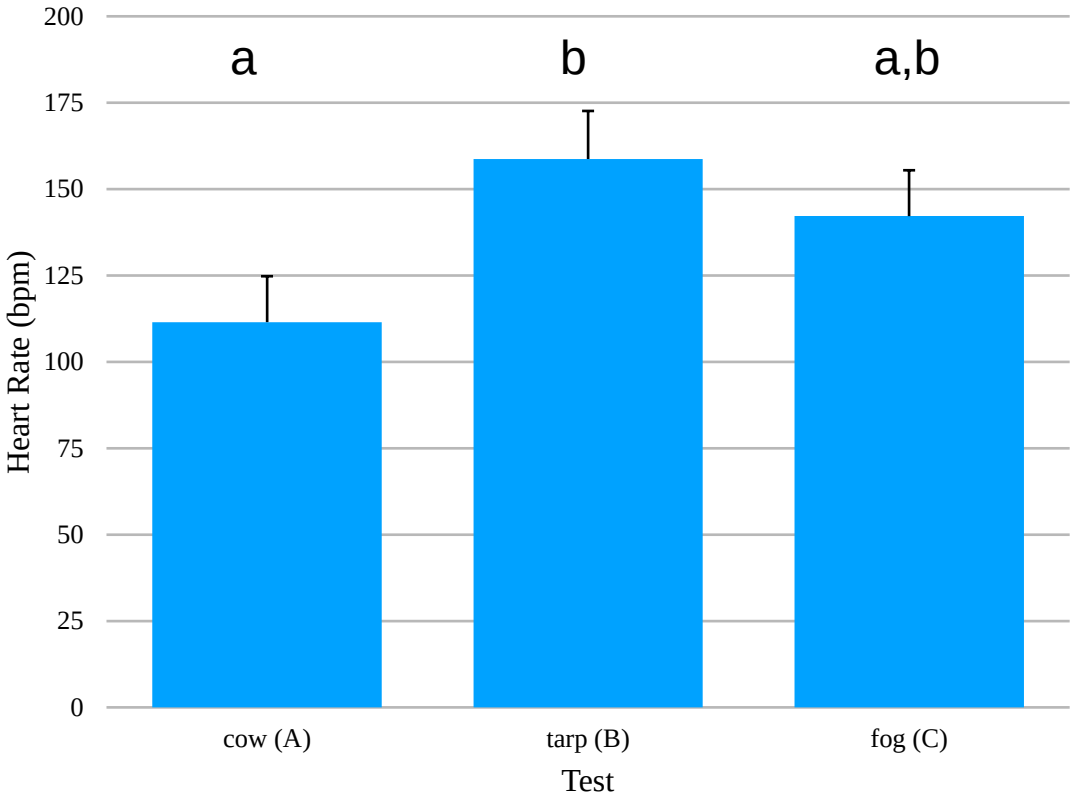

Fig 6. Comparison of overall maxHR values for the cowtracs, tarp, and fog machine to help determine EAAT suitability. Tests not sharing a common superscript are different ($p < 0.05$).

BDA	Cow (A)	Tarp (B)	Fog (C)
Anxiousness	1.81 (±0.50)[a]	2.97 (±0.50)[b]	2.47 (±0.50)[a,b]
Excitability	1.95 (±0.51)[a]	2.78 (±0.51)[a]	2.53 (±0.51)[a]
Inquisitiveness	2.08 (±0.58)[a]	2.83 (±0.58)[a]	2.58 (±0.58)[a]

Table 1. Scores with P-value comparisons for Anxiousness, Excitability, and Inquisitiveness average scores assigned after spook tests to determine EAAT suitability.. BDA's not sharing a common superscript are different ($P < 0.05$) between tests.

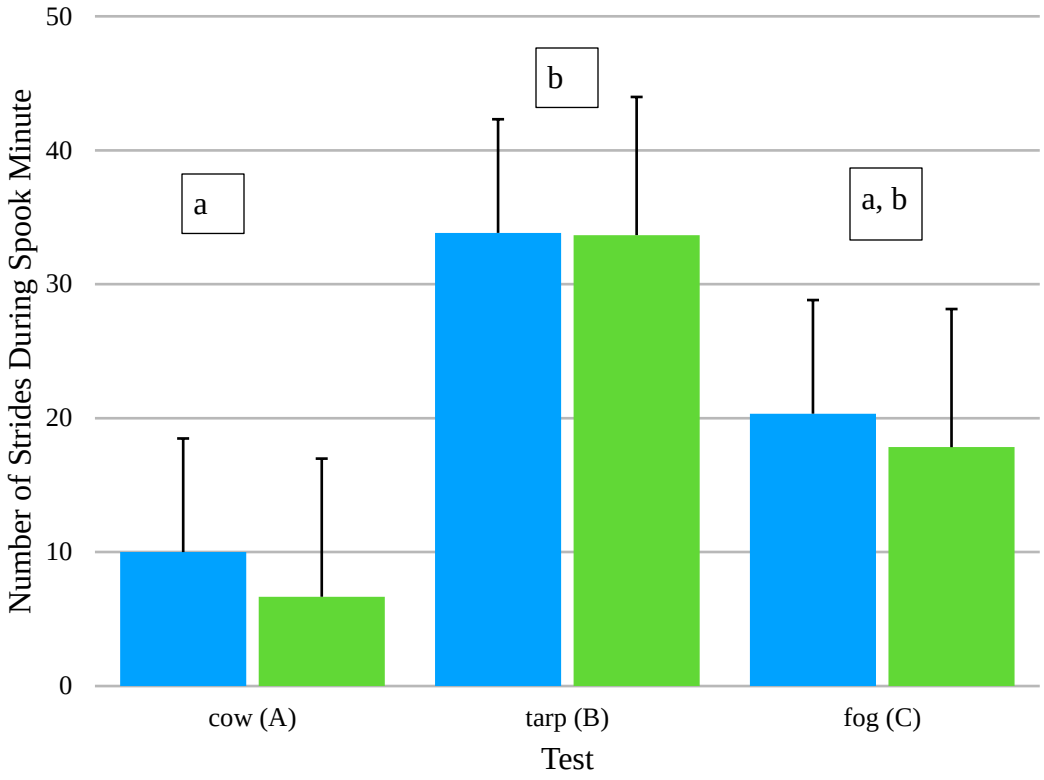

Fig. 7 Comparison of the average number of strides taken during the first spook minute and second spook minute for the cowtracs, tarp, and fog machine to help determine EAAT suitability. Strides were counted by watching video observations. One stride was counted by the number of times the front left foot hit the ground.

Discussion

When Andrea's suitability scores were compared to maxHR across all tests, the correlation was high at r = 0.90 (P = 0.033). This shows that heart rate can be a very good indicator of suitability when compared to instructor scoring. For Anxiousness, Excitability, and Inquisitiveness BDA scores, the correlations were not as high: Anxiousness at r = 0.68 (P = 0.10), Excitability at r = 0.77 (P = 0.08) and Inquisitiveness at r = 0.68 (P = 0.10), respectively. Even though these values are above a P-value of 0.05, the values were considered to tend toward significance at $0.05 < P < 0.10$.

Horses were allowed rest periods to return each horse's heart rate to baseline before the next test. This allowed for more uniformity in test results. This does not have to be done if this method of testing is used as a basis for suitability testing, which cuts down the time spent on actual testing to 24 minutes for all three tests. However, if multiple horses are being tested then it may be better to incorporate the resting time for more accurate results.

Not all test items have to be used. If this test is used as a measurement of therapy riding suitability, then it is recommended that the individual testing the horses use objects that are already present at the testing site. For example, a blue tarp was originally planned for the test, but instead a grey tarp was used and attached to a blue lunge line. For our purposes, we wanted to see whether or not the tarp would work effectively for a reactivity test. The tarp was a very effective tool to use even without placing any emphasis on the color. Color testing would be another possible direction of study. Graf (2014) used blue objects because a previous study suggested that blue made the horses more reactive, but more research in this area would be beneficial.

As for objects used, tarps have been used most frequently because of consistently positive results (McCall et al., 2006; Hanggi, 2010; Leiner and Fendt, 2011). Munsters (2012) used a smoke machine during police horse testing, while we used it because it was available to us because of previous research at MTSU. There was no evidence that a cowtracs had been used in reactivity testing, but we decided to use it on the horses since it was available and we wanted to know how effective it would be in promoting a response from the horses.

The best test to use for an EAAT suitability test based on the results of this study was the tarp reactivity test paired with heart rate data collection and behavioral observation during the test. A smoke machine could be used, but may illicit less response. A cowtracs would most likely not be a useful object as few horses, regardless of suitability, showed reaction. BDAs may prove more effective with more horses. The best option for suitability reactivity testing is that each individual location use items already present in that therapy program environment. If a horse cannot handle an object it may see in its everyday environment, it should not be used in the EAAT riding program.

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Appendices

Appendix A

Glossary of Terms

BDA: Behaviorally Defined Adjective; A word or several words used to describe a certain behavior in the simplest way possible.

bpm: Beats per minute. This is used when describing heart rate.

Cowtracs: Also known as a mechanical cow, this object is used to train horses for Western events like cutting, reining, and calf roping. It has a long cord that can be stretched along an open area with a flag (or other object) attached. A motor runs the flag along the line, and the horse is taught to follow the flag.

Girth monitor: This is a tool that takes heart rate measurements, usually used for training and fitness testing. It is strapped just behind the elbow of a horse, and wraps around the horse close to the withers.

Habituation: Simple learning process in which an individual learns not to react to a certain object or stimulus after being exposed multiple times.

HR: Abbreviation for heart rate

Horse Science Center: Location of horse testing in Murfreesboro, TN.

HPQ: Horse Personality Questionnaire; A test that a person uses to examine a horse's behavior, which can be a scored test. It usually lists words or actions that could describe a horse, and the person evaluating that horse marks how the horse is most likely to react or behave.

IACUC: Institutional Animal Care and Use Committee; This committee is present to make sure that proper guidelines are being followed with animal care and use in different settings.

PATH: Professional Association of Therapeutic Horsemanship International; The goal of this group is to promote safely and quality in all horse-assisted therapy and riding programs.

Riding: PATH uses riding lessons to promote physical and mental health to individuals with special needs.

Appendix B

Temperament Expression Table

Score	1	2	3	4	5
Anxiousness					
Level of Fear	No Expression (droopy head/ears, relaxed body)	Below Average	Average	Above Average	Full Expression (Extreme) (whites of eyes, head high, stiff body)
Movement	No movement/ restlessness	Low movement/ restlessness	Some movement/ restlessness	High level of movement/ restlessness	
Speed of Movement away from object	None	Very Slow	Moderate	High	Very High
Excitability					
Level of Stimulation (not necessarily from fear)	No Expression (head low, relaxed body)	Below Average	Average	Above Average	Full Expression (Extreme) (ears and head up, tense body)
Movement	No movement/ restlessness	Low movement/ restlessness	Some movement/ restlessness	High level of movement/ restlessness	
Speed of any movement (whether closer or further away from object)	None	Very Slow	Moderate	High	Very High
Inquisitiveness					
Level of Interest in novel object	No Expression (head and body relaxed, far from object)	Below Average	Average	Above Average	Full Expression (Extreme) (touching or very close to object, tense body)
Movement	No movement/interest	Low movement/interest	Some movement/interest	Highly interested	Focused only on object
Strength of interest in novel object	Focus completely on surroundings	Focus mostly on surroundings	Partial focus on surroundings	Little focus on surroundings	No focus on surroundings