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Development of an Ethogram to Evaluate Equine Behavior and Stress in Riding Programs

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Murray State University Honors College

HONORS THESIS

Certificate of Approval

Development of an Ethogram to Evaluate Equine Behavior and Stress in Riding Programs

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Development of an ethogram to evaluate equine behavior and stress in riding programs

Submitted in partial fulfillment
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Anna Collins

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Table of Contents

Illustrations/Figures/Tables

Abstract

This pilot project reviewed existing literature to develop a more applicable and easy to use ethogram (behavior chart), which could become a standard for riding programs to assess the safety and stress loads of program horses. Behaviors within the rubric included various head movements, mouth gestures, ear gestures, tail gestures, locomotor behavior, and miscellaneous changes such as eye visibility. The model developed was modified from previously published behavior rubrics, and then used to analyze the efficiency of evaluating horse behavior from a live observation compared to reviewing video footage. Data was collected from a total of nine horses used in a University riding class. There were two days of data collection conducted within a four-week period. Audio recordings from four independent observers were used to analyze horses while tacking up, riding, and un-tacking. Additionally, a video was taken of each horse along with audio recordings, and used for subsequent evaluation regarding the accuracy of the audio recordings. When analyzing videos, pausing was permitted for note taking, however rewinding was not. The behavior rubric was determined to be an efficient and thorough guide for observing horse behavior. However, video assessment allowed for increased accuracy. Rubric accuracy could also be improved through increased familiarity of observers with the rubric. Finally, evaluating the accuracy of this rubric in different disciplines and riding programs will be important for validation.

Keywords: Ethograms, equine, behavior, stress, stereotypic behaviors

Introduction

The fundamental goal of any equine operation should be to maintain the welfare of the horse. Providing adequate care requires a general understanding of how a horse may demonstrate their discomfort. Like people, individual horses may show different signs of stress under similar circumstances. An event that causes stress for one horse may not cause stress for another.

There has been rising concern regarding stress levels in horses used for all forms of riding schools, including private lesson programs, university riding schools, and therapeutic programs (Anderson et al., 1998, Kaiser et al., 2006, Fazio et al., 2016, Gehrke et al., 2011, Minero et al., 2006). Allowing a break from the clinical setting, therapeutic riding centers have proven to be of great assistance to individuals living with disabilities (Bass et al., 2009). Such programs, generally operated by certified trainers, use horses as a form of treatment for people with emotional, physical, and psychological challenges. However, horses used for these programs are subject to various riders and situations that could potentially add excess stress to the horse, and consequently the rider.

Currently, there has been limited research evaluating stress in horses used in riding programs. Behavior evaluation is one method of stress assessment that has been conducted in a variety of ways. One such method separated behaviors into a series of opposites, such as patient vs. impatient and serious vs. playful (Anderson et al., 1999). Others used a numeric scale (Borstel et al., 2011; Hall et al., 2014). Actual rankings were represented in different styles. One scale provided numeric rankings assigned to horses

ranging from very relaxed to frightened and avoidant (Hall et al., 2014). Yet another study implemented a 1-10 scale measuring activity, emotional expression, intensity of rider's cues, horse reactivity (as viewed by the scientist), horse reactivity (as viewed by the rider), and time to calm the horse down (Borstel et al., 2011). The variety of methods makes it difficult to compare results. Thus, this study developed and tested a comprehensive behavioral assessment rubric adapted from those previously published. The rubric was tested on horses used in beginner level riding courses at a university program. Horses were observed while being tacked-up, ridden, and while untacked. The tested rubric will go on to be used in future studies assessing stress in horses within various riding programs.

Literature Review

Summary of Stress Symptoms

In the same way that humans have various methods of showing stress, horses express their stress differently. Before we can evaluate the potential stress a horse is under, it is crucial to have the capability to recognize the symptom(s) they may demonstrate (Table 1) and how it may be induced. One investigated sign of stress is that of cribbing. When a horse cribs their system releases endorphins, which potentially influences their sense of well-being. In addition to this, the process creates a fair amount of distention in the stomach from the air being inhaled. Brain physiology, gastrointestinal irritation, and environmental factors have been evaluated in an effort to better understand what might prompt a horse to crib (Wickens et al., 2010). A common agreement found among researchers is that cribbing can be an adaptive behavior for a horse to be able to manage

stress stemming from various factors (Wickens et al., 2010). Both crib-biting and weaving are also classified under stereotypic behaviors, or behaviors horses develop as a means of trying to manage their own stress (Young et al., 2012). Considering that horses are commonly understood to be social, herd animals accustomed to routine, it would be predicted that situations such as abrupt weaning, lack of routine, and social isolation would be potential stressors. For example, certain weaning methods work to reduce stress in foals during the weaning process. One of the least stressful methods is the practice of removing a few mares at a time from an established herd of mares and foals, allowing foals to stay in the same environment and maintain familiar herd mates around them throughout the process.

Ethograms, or behavior evaluation rubrics, have been used to assess stress in horses. These offer a list of significant observable behaviors or postures horses may display while under varying levels of stress (Hall et al., 2013). Examples include head/nasal plane position, head/neck carriage, head movement, ear position, mouth, tail, salivation levels, and auditory signals (Hall et al., 2013). There are several existing versions of behavioral scoring systems, each molded to the specific needs of the study they are used for (Hall et al., 2013; Kaiser et al., 2006). Ethograms allow researchers to break down behavioral characteristics, which can provide detailed readings of how a specific horse is acting at that time. Such readings can then be assigned to numerical ratings in order to compare equine personalities or in this case, stress levels. The key to this ethogram is its ability to assess the horse carefully from head to tail and rate each variation of the listed characteristics. This method allows for careful analysis, promoting viewers to

acknowledge the minute changes. Such a detailed ethogram worked well in Hall's study because each of the rides were video taped, allowing for multiple viewings. These evaluations were then used to assign two different numerical scores, one granting separate evaluations of the relaxation, energy, compliance, suppleness, confidence, motivation and happiness levels, and the other using a 1-5-point scale to represent very relaxed to frightened/avoidance behaviors. In the event that video recording is not available, complications could arise from implementing such a detailed ethogram. This evaluation would not allow for the simplistic, quick evaluation of a horse required by in person observations. In addition, using a 1-5 scale leaves opportunity for a horse being rated in the middle, which does not provide the best representation for behavior. By implementing an even numbered scale there is a defining point that either the horse is demonstrating behaviors more evident of stress or more evident of relaxation.

Behavior scales have also been used alongside cortisol and heart rate measurements, which concluded that various management practices could have a biological effect on equine stress levels (Young et al., 2012). In addition to observable signs, stressed horses will also tend to have an elevated heart rate and increase in cortisol concentrations (Ille, 2013).

Table 1. Description of common abnormal behaviors in horses.

Behavior	Description
Cribbing	The horse grabs a hard surface (fence post) with its incisors, arches it's neck, pulls back, and sucks in air.
Crib-biting	When horses develop the habit of biting/chewing surfaces such as wood.
Weaving	Horse moves side to side while moving the head and neck back and forth as well.
Stall Walking	Constantly circling the stall, often while calling out and/or defecating.
Pawing	Repetitively striking the ground with a front foot.

Positive Effects of Stress

Stress is commonly associated with negatively impacting behavior and health. However, positive results of stress are far less emphasized. There is an advantage to having manageable amounts of stressors present. Stress does not strictly accompany instances of fear or isolation; horses experience natural fluctuations of stress throughout the day. Monitoring cortisol levels is a way to track these fluctuations (Hall et al., 2013). In understanding the positive arguments for stress, it must be understood that cortisol is a hormone given off during moments of increased excitement or fear (stress). Once released from the adrenal cortex, it aids in the breakdown of primary energy sources: fat, protein, and carbohydrates. Once the horse's system gets a dose of cortisol, it will equip the body with increased energy to allow for an appropriate response. As an animal of prey, it would be vital for horses to have the capability to react abruptly in order to escape a life-threatening situation. Consequently, stress is not only a negative occurrence, but also plays an instrumental role in physiological adaptations beneficial for survival.

Negative Effects of Stress

When a horse is feeling significant stress, they are more at risk for development of abnormal behaviors. Problems stemming from the initial stressor also include increased health risks and diminished performance levels. Cribbing has been linked to abnormal tooth wear, dental disease, weight loss and poor condition in horses as a result of diminished time spent consuming food (Owen, 1982). In addition to spending more time cribbing than eating, the behavior can be considerably destructive to the farm itself, requiring fence and stall repairs. In extreme cases, studies have considered the potential link of cribbing to a specific form of colic known as epidpolic foramen entrapment. This is essentially where a section of the small intestine slips through a separation in the tract (intussusception) leading to obstruction and lack of circulation to a section of the intestine (Archer et al., 2004; Archer et al., 2008). Colic treatment and surgeries can be expensive and run the risk of being unsuccessful, thus what started as a mild stressor on the horse could advance to a life-threatening situation. Like cribbing, crib-biting (chewing on wood) can be hard on the horse's teeth. It also poses a risk for the horse consuming dangerous foreign material such as wood from a fence or stall. Weaving and stall walking are two other stereotypic behaviors leading not only to health deterioration but also diminished performance. The constant side-to-side motion of weaving can add substantial stress to the tendons and ligaments of a horse's leg. On occasions, Thoroughbreds, labeled excessive stall walkers, have been retired from the track due to their inefficient expense of energy in the stall negatively impacting their performance on the track (Houpt, 1981). Teeth grinding and overall body tension also seems to be

characteristic of horses with high stress (Hall et al., 2014). Teeth grinding can result in uneven tooth growth and, like cribbing lead to nutritional deficiencies.

Cortisol concentration is a commonly accepted measurement of stress levels (Anderson et al., 1999) and is used as the foundation for identifying stress related behaviors that would consequently diminish the health of the animal. While physiological stressors of inexperienced riders on horses may be the primary focus of some (Greve et al., 2012), others examine the effect of mismatched horse and rider experience levels on equine cortisol, heart rate and heart-rate variability over a jump course (Ille et al., 2013). Although it was found that inexperienced riders contributed to increased cortisol concentrations in the horses, there was not a significant difference found in the horse's heart rate measurements (Ille et al., 2013). Therefore, by measuring cortisol concentrations while noting behaviors, researchers may be able to link a certain behavior to stress. If blood cortisol concentrations remain too high for an extended period of time, a state known as muscle wasting (proteolysis) can occur through the *de novo* synthesis of alanine (a gluconeogenic substrate) (Simmons et al., 1984). Overall, when horses are exposed to mental stress they may be affected through failing performance levels, negative health, and potentially destructive behavioral problems (Hall et al., 2014).

Causes of Stress

Various studies have attempted to determine what factors influence stress in horses. Although some situations still remain in debate, it is generally accepted that poor management, social isolation, concentrate based diets, and certain weaning methods will

lead to higher levels of stress and undesired stress related behaviors (Wickens et al., 2010).

The rider and/or handler can play a role in influencing a horse's inherent behavior (Borstel et al., 2011). Therefore, trainers, handlers, and riders alike have an impact on how horses react in certain situations. When presented with a variety of stimuli (visual, visual/tactile, and visual/auditory), the rider's level of nervousness impacted the horse's behavior and its heart rate in the situation (Borstel, 2011). This would support the concept that a calm and confident rider could serve as a method of diminishing the amount of stress a horse might feel in a new or seemingly threatening situation. However, if the horse is already stressed about an uncertain set of circumstances, having a nervous or unconfident rider could escalate the situation.

While handling or training methods may impact behavior, a horse will likely have a natural tendency to be more or less reactive from the day it is born (Borstel et al., 2011). Therefore it is how people working with them handle these reactions that determines if the situation escalates or is calmed down quickly without incident. Extending on this, some suggest that horses will respond better or worse based on their learning environment, potentially overcoming their natural tendencies (Fureix et al., 2009). Researchers separated horses into two groups trained using two different methods. The first was a more traditional method, incorporating more direct positive and negative reinforcement, while the second was natural horsemanship, which focuses on yielding to pressure and liberty style exercises (Fureix et al., 2009). Neither of the styles are

considered harsh; they simply approached training from two different perspectives. In particular, natural horsemanship is based on humans incorporating more natural horse behaviors into training. Ultimately, natural horsemanship training methods demonstrated a higher level of effectiveness (Fureix, 2009). By adapting training methods to encompass what horses are accustomed to in a herd setting, trainers were able to limit stress, fear, and frustration for a more effective and efficient learning environment.

The proposition has been made that lack of rider ability and balance can lead to physical stress and discomfort of the horse in the form of hollowness of the back, loss of core strength and potentially the development of thoracolumbar region pain (Greve et al., 2012). Something to take into consideration with application of this data would be the difference between horses that are being worked consistently by an inexperienced or unbalanced rider versus horses that are offered tune-ups fairly consistently by riders who will make them work properly. In addition, a horse that is tense throughout their body will likely begin to move improperly, resulting in soreness that would have otherwise been absent.

Measuring Stress

The two most widely accepted and accurate methods of measuring stress in horses are collecting cortisol samples and measuring heart rate variability (HRV) (Anderson et al., 1998; Borstel et al., 2011; Fazio et al., 2013; Gehrke et al., 2011; Hall et al., 2013; McBride et al., 2004; McKinney et al., 2015; Monk et al., 2013; Young et al., 2012). Cortisol concentrations may be determined either in saliva or plasma (Turner, 2014).

Cortisol is a steroid hormone released by the adrenal cortex during instances of anxiety or low blood-glucose. High anxiety situations in horses have been shown to result in an increase in salivary cortisol concentration (Hall et al., 2014). However, because the hormone also aids in digestion of proteins, lipids and carbohydrates, caution should be taken when using this as a measure of stress. Concentrations are going to be naturally higher immediately following meals, as the body must release it in response to the introduction of lipids, proteins and carbohydrates. Therefore, measurements should be taken during the same time of day if accurate comparisons are to take place.

Recent studies have investigated the potential for measuring stress via eye temperature of the horse (Hall et al., 2014), or by measuring cortisol concentrations present in tears (Monk et al., 2014). Eye temperature is measured by use of a thermal camera, with the full eye temperature being measured at each sample time (Hall et al., 2014). Maximal eye temperature was recorded during a ridden test, suggesting that was the time of maximal stress as compared to being at-rest, warming up, directly after the warm up, or after the ridden work (Hall et al., 2014). It has been hypothesized through ACTH (adrenocorticotropic hormone) stimulation that cortisol was constantly present in the tears as well, with elevations during stress (Monk et al., 2013). This would present another potential accurate method of cortisol collection. Salivary cortisol is known to correlate with the circulating free form of cortisol as opposed to the form bound to protein (CBG and albumin), however in equine tears researchers found both forms to be present at all times (Monk et al., 2014). Increased stress levels were correlated with tear cortisol concentrations (Monk et al., 2013). Both eye temperature and tear cortisol concentrations

are more contemporary explorations and have not been as rigorously tested at blood/salivary cortisol and heart rate variability.

Heart rate variability (HRV), a measurement that has been around since 1965, is another fairly accurate method of measuring stress (Reed et al., 2005). This approach measures the time interval between heartbeats. The two primary inputs balancing the HRV are the parasympathetic (body function regulator) and sympathetic (fight or flight) nervous systems (Reed et al., 2005). With inhalation, the heart rate will speed up. Upon exhalation, the heart slows down (Borell et al., 2007). This natural give and take of the rest between heartbeats is what is measured by HRV. When HRV is diminished due to a stressor, this represents a disruption of nervous system function, meaning the body becomes less able to fluctuate appropriately (Horsten et al., 1999). A strong association has been made between animals with decreased HRV and spontaneous vein fibrillation threshold and death (Kleiger et al., 2005).

As mentioned previously, ethograms are another method used to evaluate equine stress. They are commonly applied in conjunction with measures of salivary cortisol and HRV for more accurate ratings (Hall et al., 2013; Kaiser et al., 2006; McKinney et al., 2015; Minero et al., 2005). In a study combining HRV, cortisol measures and ethograms, one ethogram was created providing a detailed range of key behaviors to look for in subject observations (Hall et al., 2013). Through coordinating the three methods of analysis, the research team was able to compare stress levels in horses through all three parameters giving a very detailed analysis of both the inner and outer effects of stress on the body.

Despite previous behavior research being cited within subsequent articles (Kaiser et al., 2006), modifications are frequently made from the original ethogram in order to accommodate the new studies needs (Fazio et al., 2013; Hall et al., 2014; McKinney et al., 2015). This would demonstrate that even a frequently referenced study doesn't provide a simple, overarching rubric that may be applied.

Stress in Riding Programs

Riding schools and programs are often set up to teach large groups of students everything from the fundamentals of riding to advanced competition skills and strategies. However, concern has developed surrounding the quantity of stress horses in riding programs may be experiencing on a daily basis (Kaiser et al., 2006; McKinney et al., 2015). The continual demands on school horses can be quite high, as a variety of riders (often in different levels or even disciplines) work with them each week. A clear increase in cortisol levels was observed when less experienced riders were paired with less experienced horses over a designated jump course as compared to more experienced horses and riders being paired together (Ille et al., 2013). In addition, when rider confidence was lower, equine heart rate increased for the same level of exercise (Ille et al. 2013). The implications of this study demonstrate the effect of improper pairings in a lesson or school barn setting.

In a similar study, four therapeutic horses and four jumping horses were subjected to a stress test while researchers monitored heart rate, HRV, and scored the horses through an ethogram (Minero et al., 2005). The research team expected that the therapy horses would

ideally have limited reactions as compared to the jumper horses, as the therapy horses should have gone through desensitization training and in general been recruited for their more docile temperaments. However, therapeutic horses surprisingly reacted no less than the jumper horses to the new stimuli (Minero, et al., 2005). Results suggest that therapy horses could pose just as much of a risk to their riders as a typical jumper horse when stressful stimuli are presented.

Horses considered acceptable for therapeutic riding programs must meet a variety of requirements (PATH International, n.d.). Concrete characteristics that are quick to be evaluated include age, size, gait smoothness, health, and soundness (PATH International, n.d.). A therapy program needs to be able to invest in horses that are going to be easy keepers and be able to comfortably work for several years. However, a less concrete characteristic that is needed is a docile temperament. This attribute is much more difficult to evaluate. One process known as the Spink system can be used in conjunction with a case-by-case trial period for horses once they make it past the preliminary expectations (Anderson et al., 1999; Fine, 2010). It is intended to fairly evaluate the potential of prospective and current therapy horses through three key analytical steps: objects, position change, and backriding (Fine, 2010). Horses are given a rank based off of their behavioral screening score from each sections real-life challenges (Fine, 2010). It is intended that from this test, evaluators would then understand what behaviors are considered acceptable from a horse in the program (Fine, 2010) However, even certified riding instructors come to disagreements on whether or not horses are appropriate, thus demonstrating the objectiveness of the system.

Recently inquiries have developed concerning the stress levels felt by horses used in therapeutic programs (Anderson et al., 1998; Kaiser et al., 2006; Fazio et al., 2016; Gehrke et al., 2011; Minero et al., 2006). One related study found a lack of difference in mean number of stress related behaviors of horses ridden by four different groups of riders: recreational, physically handicapped, psychology handicapped, and special education (Kaiser et al., 2006). However, when an at-risk group of riders were included, these mean numbers for the horse's stress levels were found to significantly higher (Kaiser et al., 2006). At-risk students included those that would be considered at risk for lower educational performance due to low income, having a single-parent, already demonstrating low school performance, or having required disciplinary action (Kaiser et al., 2006). Although short-term studies have demonstrated a lack of significant detrimental effects to the horses, there is currently not significant data available on a long-term scale for horses present in equine assisted therapy (Gehrke, 2011).

Comparison studies do exist between horses used in equine assisted therapy (EAT) versus those used in traditional riding programs. Salivary cortisol concentrations have been measured along with behavior scores to evaluate the difference between horses used in a traditional hunt seat program versus a therapeutic riding program (McKinney et al., 2015). There were seven characteristics defined as symptoms of stress: pinned ears, raising the head, turning the head without the aid of the rider, tossing the head, shaking the head, holding the head down, and defecating. As with Minero et al. (2006), no significant stress differences could be detected between the two groups of horses.

Equine Stress and Rider Health

The safety of the rider should be considered alongside the concern for the welfare of the horse. When a horse becomes stressed by an unfamiliar stimulus, even those used in therapeutic programs have been documented to react as much as non-therapeutic horses (Minero et al., 2005). Training should be a continual process, meaning that simply because horses were desensitized to one subject in their life or trained in a certain way, it does not mean that tune-ups are not necessary. Horses are extremely capable of discriminating stimuli (McCall, 1990). Therefore as a trainer, consistency of the deliverance of cues is vital in maintaining a specific response for a specific cue (McCall, 1990). Otherwise, the horse begins to associate an increasingly general cue for the same desired response (McCall, 1990). Thus, the sensitivity from the horse decreases and continually stronger cues will be required for the same desired reaction. This would be ideal within a lesson program to a point. The issue arises when the horse begins to completely ignore any signal from the rider. This results in a horse that won't stop, go, turn, or respond to any other maneuvers it has previously been trained to complete, with a student who potentially lacks experience in handling such situation. Special care should especially be taken in regards to a fearful or timid rider, as this has been documented to transfer and raise the stress levels of the horse (Ille et al., 2013) possibly causing a dangerous or negative experience.

In addition to confidence, the rider's ability to have proper rein contact, leg stability, and over all balance can also affect the stress levels of the horse (Thompson et al., 2015). The incorrect application of aids has the potential to create a miscommunication and

confusion between horse and rider, along with resistance or discomfort for the horse (Thompson et al., 2015). This is especially prevalent on more reactive/sensitive horses. During riding, it is the release of pressure that horses search for. When multiple conflicting aids are applied at the same time, there is no release, and nowhere for the horse to go. Taking proper steps to ensure that cues are applied consistently at the appropriate times can lead to reduction of potentially dangerous incidents (Thompson et al., 2015).

Controlling and Limiting Stress

Once the causes and symptoms of stress are recognizable, it is possible to look into ways to reduce it. In some instances, horse owners might be able to note ways in which their horses try to manage heavy stress loads on their own. This is achieved through the development of stereotypic behaviors. Adopting actions such as cribbing, weaving, and head shaking have been projected as a way of horses attempting to take control of what may be a frustrating or unsteady environment (Young et al., 2012). Providing them with access to other horses, forage based diet over concentrate, a steady routine, and adequate exercise could all serve as methods of stress diminishment (Young et al., 2012).

In the instance that these methods are not available or effective, an alternative may be equine massage therapy. Massage has been practiced as a form of healing for humans for centuries. It is only natural that the practice is gaining popularity to assist in relieving the stress of our equine counterparts. Comparisons have been made between the effects of massaging areas of allogrooming (where horses would choose to groom one another)

opposed to the less common areas of allogrooming (McBride et al., 2004). Horses perform this behavior in the wild as a means of hygiene, affiliation, and diversion of aggression (Vea, 1999). It was when the most common sites of grooming were massaged (withers and mid-neck), that researchers noted the largest drop in heart rate (McBride et al., 2004). Due to the data presented, a method that could be implemented would be to have riders groom or massage around the withers and mid-neck before getting on the horse as a means of stress reduction.

Summary

In essence, it is natural for any animal, including horses, to feel stress. It is when stress rises to unmanageable levels that negative behaviors and impacts to the health and performance of the horse are noted. There are steps that can be taken to reduce the amount of stress horses are exposed to. Being able to identify signs of stress from a behavioral standpoint could allow instructors and managers of riding schools the ability to maintain the highest levels of safety and comfort for the horses and humans involved. The objective of this study was to develop a behavior scoring rubric and evaluation process that could be applied to a variety of riding programs in order to create a standard for the accurate assessment of stress levels present in the horse. This research was intended as a pilot for a future study, which would directly evaluate the stress of horses in a therapeutic riding program.

Methods

Meetings of the three graduate students, one undergraduate, and two faculty advisors that made up the research team were held starting the first week of August. Discussion was based on the determination of an appropriate ethogram and gaining general background knowledge concerning equine stress behaviors and riding programs. Existing literature was researched in order to better understand previously published behavior rubrics, and determine which might best serve the study. Behavior rubrics that each member found were then presented for group collaboration. Both the positives and negatives of each presented ethogram were considered along with how their original study incorporated them. Prior to the first data collection, faculty advisors selected previously published ethograms that were then adapted for use in the current study. Methods required for accurate statistical analysis of the chart were taken into consideration. Prior to data collection, the research team met in order to review the chosen ethogram (Appendix A).

Data Collection – Initial

Data collection began in October 2016. Because this data's rubric will be used for data collection in the spring of 2017 at a therapeutic center and also for the study of the Universities horses, methods were purposefully tested for accuracy and application. Assigned tasks included one videographer, three student and one-faculty evaluators, and a timer. Evaluators used voice-recording devices to record observations of behavioral signs in horses during the class. Each evaluation would begin with the timer stating the horse to be focused on. With the acknowledgment that the videographer and observers were ready, timing and evaluation would begin. Having the experience of the faculty

advisor commentating combined with the video recording served as a method of accuracy assessment of all observers involved. One important aspect of the study was to test what video material might reveal that in person evaluations, regardless of experience, might potentially miss. The riders were not in any way evaluated, and class was carried out as if the researchers were not present. The usual routine of grooming, tacking up, riding, and un-tacking remained undisturbed by the research team.

Testing was conducted on a university basic stock seat riding class. Horses ranged from 7-19 years of age with the average age being 13.9 years. The majority of the horses (n=7) were Quarter Horses, along with one Pony of the Americas, and one Paint. Although nine horses and riders were signed up for the class, only six were present on the day of initial data testing. This included four geldings and two mares.

Each horse was given a number as they walked into the riding facility, with 1 being the first horse to enter and 6 the last. This number was marked with livestock paint on each horse's hips. There were three primary sets of evaluations. Observation one began as soon as the first horse entered the tack-up area and was tied along the tie rail (Table 3). As horses were groomed and tacked up on the tie rail, each horse was observed for one minute. Only behaviors observed in that one-minute time frame were noted for each horse. Not all horses were observed undergoing the exact same activities. Some horses were primarily being groomed while others were being tacked up. Horse 4 required a second observation due to technical difficulties with the video camera.

The second set of evaluations was conducted during the ride. The instructor continued with class as normal while the research team evaluated each horse in the lesson for a two-minute time frame, three separate times. Initial order was determined by the order the horses entered the ring so as to keep observations as random as possible. Each sequential observation during the ride was kept in order from the first arena observation, so that the order each time remained constant (Table 3). Arena observation did not begin until all horses were present in the arena and the class had begun. There was one ridden video-only observation during the students free-ride time. During this time, the instructor ceased leading activities and allowed the students to work on maneuvers that they desired to practice. Although the instructor and instructor's assistant would occasionally step in to offer input, horses and riders were otherwise left alone. Videos were taken at random and were untimed.

The final observation period was one, one-minute time frame for each horse. The un-tacking process is often significantly faster than tacking up, which dictated a shorter observation time. Observation began with the first horse to reach the tie rails, after which the team moved down the tie rail for time efficiency (Table 3).

Following data collection, a meeting was held in order to debrief the effectiveness of the methods used for the collection session. Small adaptations were made for the subsequent data collection date in order for the process to run with increased efficiency. One such change included the suggestion of placing the video camera on a stage with a tripod so that instructors and researchers on the ground never obstructed the view of the horses.

Data Collection – Revised

Before the second day of data collection, a meeting was held in order to review protocol revisions. First, a stage was set up in the center of the arena to aid the videographer in gaining a clearer view of the horses during the riding portion of the evaluation. Second, a general four-point rating scale was formed to allow observers to give an overall impression at the end of each observation for easier comparison among horses (Table 2).

Horses each received new hip numbers, which were again assigned in the order that they walked into the arena (Table 3). There were eight horses present during the second data collection, increasing sample size. Six were geldings and two were mares. Horses 5 and 6 required a second viewing during tack up due to lack of interaction (the rider did not approach the horse during the observation period) and view interference (the adjacent horse on the tie rail become agitated and shifted much closer to the horse under observation). Protocol for the sequence of data collection (timing, order, etc.) was as previously explained. There was revision in how the free-ride time was viewed for this collection. During the initial collection, the free time evaluation was less structured and unplanned. It was only after seeing that some horses were acting differently when not in a lesson scenario that the decision was made to take another video for that day. In the revised data collection day, it was planned before observation began to include the free ride time as the third ridden evaluation.

Table 2. Scale to be used in conjunction with behavior rubric.

Grade	Description
1	Calm/Willing.
2	Slight reluctance but obeys.
3	Significant reluctance and resistance.
4	Fighting/highly resistant, may not obey.

Table 3. Observation Order.

Observation period	Order of observation
Initial Test 1	1, 2, 3, 4, 5, 6
Initial Test 2-4	3, 1, 6, 5, 4, 2
Initial Test 5	6, 5, 4, 1, 2, 3
Revised Test 1	1, 2, 3, 4, 5, 6, 7, 8
Revised Test 2-4	5, 3, 2, 1, 6, 8, 4, 7
Revised Test 5	7, 3, 2, 1, 8, 5, 6, 4

Results and Discussion

Evaluator Background

There were varied experience levels among observers. Observer 1 was a professor at the university having significant experience around livestock and some equine experience. This observer completed a PhD and has been involved in other unrelated research studies, having a strong foundation for research requirements and understanding of statistical procedures. Observer 2 had minimal hands-on equine experience, but has a Bachelor's degree in animal science. Most of the classes taken by this observer prior to beginning their Master's revolved around the cattle, sheep and poultry industries. Observer 3 held a bachelor's degree in veterinary medicine but received only entry-level equine classes while earning this degree. The final observer, 4, had an extensive equine background, being involved in horse camps and clinics throughout their life, owning two of their own horses, and specializing in desensitization training suggesting a familiarity with horses. Observer 4 continues to take lessons in both english and western riding. All of the student research participants were studying at the university where testing was held, either for an equine related undergraduate or Master's degree.

Data Collection – Initial

Initial data collection provided an exceptional comparison of what each observer saw in person (Appendix B). Typical behaviors noted throughout the observation periods in the university horses included ear play, overall neutrality (head neutral, ears neither forward or back, general indifference), tail swishing, and tongue lolling.

One of the most prominent results was that active observers missed behaviors that were later noted during video review. Adding the video recording provided a comparison to what each of the audio recordings were demonstrating. Upon review of the video it was clear that using this method with the chart provided increased accuracy for notation of behaviors. Even though the observers were not able to rewind the video, they were allowed to pause it to take notes. This allowed them to improve upon significant details documented. Smaller movements such as lip, tongue or ear shifts were the most commonly overlooked actions. The suggested reasoning for this is that the larger, and more dramatic behaviors such as tail swishing redirected the observer's attention to that section of the body. When movements were occurring simultaneously, it became difficult to be aware of both actions. Distraction from the environment and other horses in the arena was one reason expressed for missing behaviors. The video served to solve this issue by requiring the observer to look only at the horse to be observed.

Level of experience also played a role in the thoroughness of observations and attention to detail. Evaluation of the recordings for horse two, tacking-up demonstrates the difference in details noted. For initial data collection, observer number one was unable to get any readings for comparison during the tack-up, as she was going through and labeling horses. Observer two noted only slow tail swishing and a little bit of opening of the mouth. However observer three added details pertaining to how the horse changed throughout the entire minute of viewing. These notations included how the tail movement varied, shaking of the back, and change in ear position. Recorder four went even further to include explanations for some behaviors. Tail swishing for example, was noted as

stimulation by flies rather than as a result of being handled. In addition to the notes documented by the other two recorders, recorder four also included the horse's attentiveness to the rider who was tacking them up. The most commonly noted behaviors included neutrality, ears back, ear play, tail swishing (often noted to be stimulated by flies by recorder four), tongue lolling, and attentiveness. Both rein resistance and playing with the bit were occasionally noted during riding. Horse number 6 actually displayed flopping of the ears during the first ridden observation. Such a behavior is associated with true relaxation and full-body fluidness. None of the university horses used in this section of the study appeared to have any extreme adverse behaviors during the entire testing process. All of the horses were actually noted for their relaxation or attentiveness to rider/handler at some point during the observation. The one through four final score was not implemented for this test day, as it was purely to assess the thoroughness and ease of use given the rubric that had been developed.

In some cases, the audio recordings were not accessible for observers due to either recorder malfunction or inability to understand the recording upon latter review. In future testing, doing a quick playback of the previous recording to ensure correct function might be an option. However time can be crucial, especially during the tacking and un-tacking observations.

Data Collection – Revised

Data collection proved to run smoother this round. A partial reason of this would be due to increased observer familiarity with the rubric being applied. This allowed for audio

recordings and observations to be more directed towards the phrasing and behaviors that were represented in the rubric. It created a more uniform evaluation that was capable of being compared among subsequent viewers.

One of the most significant findings was the level of importance at which video recording displayed within behavior assessment. Each of the observers went back and reviewed the video over the entire observation period (tack up, riding, un-tacking) of three horses minimum. Part of the significance in the difference between audio and video commentary, was the number of details missed within audio that might be linked to the rider. Observer 4 made this connection when reevaluating horse 7 through the video. Details such as increased tension in the horse when the rider switched from a posting trot to a sitting, and realizing that during the first riding section the horse was noted for tossing it's head presumably for no reason show minute influencers overlooked. With video review observer 4 was able to document a hidden source of the head tossing. This was that the reins that were too short which caused for more pulling on the horse's mouth, prompting the horse to display the sign of discomfort. During video review observer number 3 documented two moments in two different horses that a gaping jaw was displayed. Each of these were overlooked in the in-person observation, again demonstrating the importance of having video material to refer back to. Observer 2 most frequently over looked subtle movements of the mouth and ears, such as tongue lolling and ear play. This was especially evident in the instance that several behaviors were occurring simultaneously. By incorporating the video content, this observer was able to increase their focus by pausing it during certain segments.

An adaptation of this test was the assignment of a one through four final score of each observation section. This created consistency on the overall perception of the horse based on the characteristics the audio recorders were to be graded on. Within the numerical grading section of the behavior assessment in the revised data collection, most horses were scored within the 1-3 range. Only one horse was given a score of 4 (horse 7). All observers noted this horse as having a consistently sour expression.

During timed observation, more behaviors were expressed in the free ride section of the testing period. It was during this time that horses 1 and 2 demonstrated gaping of the jaw combined with other potentially negative behaviors such as head shaking or pulling and ears back. The highest score admitted to the university horses was the maximum score, a four. This went to horse number 7, tacking up from recorder number two. Behaviors that contributed to this horse earning the high score, included tail swishing, head tossing, ears pinned back, and head turning. There were occasional threes, however the majority of the horses included in the study stayed within the one to two range. This would suggest that horses used within the University riding program are at minimal stress levels and are therefore capable of effectively and safely doing their job within the program.

The behavior rubric modified and implemented for this study did appear to work efficiently as a means of equine behavior analysis within a riding program. Improvements may still be made in order to create a method of quantifying the specific behavior differences noted between horses. Increased familiarity with the rubric combined with

more horse experience among observers may help those recording notes to know what they are looking before live data collections. Each of the four observers within our study had a wide range of familiarity with horses, which affected the level of detail noted. Use of the video camera did improve the accuracy of observations, as it allowed for the notation of behaviors that were occurring simultaneously. Recommendation for future studies would be to test the behavior rubric created in this study on other forms of riding programs, such as riding schools. It would be informative to know that the rubric could be widely applied to programs that have different demands for their horses and would still be capable of helping them to effectively evaluate both their current and potential horses. In addition, while our research team found the rubric to be easy to apply and use, having the trainers and managers implement it into their program could provide useful input on their perception of its usefulness and their willingness to adopt it on a regular basis.

Conclusion

Overall, the modified rubric did serve as a promising means of evaluation of equine behavior. Both relaxing and mild stress behaviors were documented within the university setting study. Incorporating the video served as an efficient means of gathering more accurate data, as simultaneously expressed behaviors were often missed in person. The more dominant behavior was typically documented while the secondary, subtler behavior was overlooked. Audio transcriptions were guided by the rubric but were found to vary in detail.

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Appendix A

1. Behavior rubric modified from Kaiser et al. (2006) and Denderen (n.d.).

Behavior	Description
Head position:	
Head neutral	Head and neck are held reasonably stable in the desired position (horizontal position).
Head flexed	Horse flexes head more than required such that muzzle is drawn toward chest. Reins may dangle loosely.
Head pulling	Horse hangs/pushes against the bit/lead.
Head low	Head/neck are held lower than desired (between shoulder joint and carpus.
Head to ground	Head/neck are lowered so nose is close to touching ground/head lower than carpus.
Head high	Head and neck are held higher than desired.
Head tilting	Horse tilts nose to one side
Head turned	Horse moves head lateral towards left or right; holds for a longer (>5 s) period.
Head toss	Horse attempts to move or moves head in a quick forward-upward motion.
Head shake	Horse attempts to shake or shakes head in a quick left to right motion.
Head stretch	Horse attempts to stretch or stretches head in a slow-downward motion.
Head not visible	Head position is not visible.
Mouth gestures:	
Neutral jaws	Jaw relaxed/neutral.
Tense jaws	Teeth occluded, tense jaw, no bit movement.
Play with bit	Horse lets bit move inside its mouth.
Gaping jaw	Horse opens mouth for extended periods/opens, closes mouth repetitively/grinds teeth.
Tongue lolling	Extraneous moving of tongue in and out of mouth.
Tongue out	Tongue hanging out of mouth.
Mouth not visible	Mouth gestures are not visible.
Ear gestures:	
Ears neutral	Ears pointing sideward with little or rhythmic movement.
Earplay	Ear movement from pointing forward to pointing backward; may be unilateral or bilateral.
Ears forward	Ears pointed forward with little or rhythmic movement.
Ears backward	Ears turned backward (but not entirely flattened) for an extended period (>5s).

Ears pinned back	Ears pressed caudally against the head and neck.
Ears not visible	Ear gestures aren't visible.

Tail gestures:

Neutral tail	Tail is held in neutral position. Tail elevation is correspondingly with velocity of horse.
Tail-swishing	Any exaggerated movement of tail, usually more of a wringing motion than rhythmic or directed swishing.
Tense tail	Fleshy portion of tail stiffens with slight elevation at posterior fleshy part of the tail. Tail might also be held against body.
High tail	Tail is carried higher than expected at present velocity.
Tail not visible	Tail gesture not visible.

Locomotive behavior (note when change of gaits are asked for)

Neutral velocity	Horse moves in desired velocity and desired gait.
Velocity faster	Horse stays in desired gait but moves faster.
Velocity slower	Horse stays in desired gait but moves slower.
Halt	Cessation of movement of all four feet.
Backwards	Backward movement of the horse.
Fast backwards	Fast backward movement of the horse, usually followed after abrupt halt.
Abrupt halt	Abrupt cessation of movement and reluctance of going forward.
Change in gait	Horse moves in a different gait than desired.
Crabbing	The horse moves side-ward forward. The hind legs of the horse travel on a line beside the front legs.
Counter canter	Only at canter. Front legs on different leads than hind.
Change canter	The horse changes leads.
Helper encourage	Helper has to encourage horse to move faster.
Helper slowing	Helper asks horse to move slower.
Jumping/rearing/ bucking	Any form of movement in which the two front-and/or hind legs leave the ground.
Stumbling	An interruption of gait-specific, rhythmic footfall with loss of balance.
Falling	Horse falls/shoulder and hipbone touch ground.
Turning	Horse suddenly stops moving and turns around.
Shying	Horse shies away from an object or side of the arena.
Defecation	Expelling of feces.
Blowing	Non-pulsated sound produces by forceful expulsion of air through nostrils.
Snorting	Snorting sound of forceful exhalation through the nostrils with an audible flutter pulsation.
Groaning	Horse makes a groaning sound.
Sighing	Horse makes a sighing sound.
Coughing	Horse makes a coughing sound.
Behavior not visible	Locomotor behavior is not visible.

Miscellaneous:

Stridor	A high pitched sound resulting from turbulent air flow in the upper airway.
Visibility of eye-white	The horse shows the white of the eye for an extended (>5s) period.
Nose/eye not visible	There are not miscellaneous behaviors or miscellaneous behavior is not visible/audible.

Appendix B

Initial data collection audio and video comparison

Tack up:

	Recorder 1	Recorder 2	Recorder 3	Recorder 4
Horse 1	N/A	Dilate Nostrils	ear play, head neutral, neutral jaws, ears play, neutral tail, right hind leg step on the ground, left ear turns to left, head shake to the right,	N/A
Horse 2	N/A	Swishing tail slowly A little opening of mouth	neutral tail, back shake, tail neutral with little movement, ears back, head neutral, neutral tail with little movement, head turns to the left, ears forward, neutral tail with little movement, eyes looking around, head to the left, right ear backward, left ear neutral place, ears forward, ears backward, ears forward, ears neutral, tail still neutral with little movement,head to the left.	Attentive to handler, irritated by flies, ears back but quiet stance, slightly irritated by flies, standing quiet, neutral head position, breathing normally, irritated by the flies, irritable in general, ears facing backwards, END HORSE 4.
Horse 3	N/A	Swishing movement of tail slow Ears rotated backwards a few times	right ear backward, head neutral, ears forward, head to the left, tail neutral with little movement, head to the right, left ear backward, left ear forward, left ear backward, right ear backward, head down, right ear forward, blink, head to the left, left	Standing Calm, Listening to groomer, neutral head, tail swishing calmly for flies, standing square, ears attentive to groomer, quiet & standing still,

			ear forward, tail neutral, mouth close, left ear backward, right ear backward, ears forward, back shake, ears backward, tail neutral with little movement, back shake, right foreleg move forward.	agreeable demeanor, picked up foot on request, standing still, quiet mannered, agreeable, END HORSE 3.
Horse 4	N/A	Head turned left >5 sec Ears backwards	head neutral, head to the right, tail neutral, head to neutral, ears play, left leg move forward, tail neutral, head to the right, head up, move forward, move forward , still move forward, head down a little, ears backward, right foreleg step on the ground, head to the left, ears forward, head neutral, left leg step on the ground, head to the right, ears backward, tail neutral, head keep on the right, ears backward, head keep turns to right and backward, head forward, ears forward.	Standing calm, listening to groomer, neutral head, standing calm, listening to environment, stepped forward to position head over rail, stamping for flies, attentive to handler, ears back, seems slightly irritated. END HORSE 4.

Horse 5	N/A	Tail keeps swishing	head neutral, ears lateral, head neutral, eyes close half, tail sway to the left, shoulder shake, right leg step on the ground, tail swat to the right, ear still, move backwards, tail still sway, back shake, tail sway to the left, head neutral, back shake, tail sway to the left, move forward, tail still sway, #6 head sway little, ears play, tails play, head to the left, ears play, head forward, step back, head to right, head back to neutral, head to right, head to left, tail play, RF foot lift up, head forward.	Calm mannered, standing quiet, sleepy, stamping for flies, ears attentive to groomer, swishing tail, agreeable lifting foot, quiet mannered, listening to owner, lifted hoof on request, ears forward, END HORSE 5.
Horse 6	N/A	Tail swish Head shake Blow sound	ears backward, head neutral, left foreleg step forward, right foreleg shake, head to the right, left hind leg move, tail neutral, eyes look down, nose move, blink, right hind leg move, tail move backward, head to the right, left ear backward, still.	Listening to handler, possibly slightly irritated, lifted hoof on request, attentive to environment, seeming irritated from flies, slightly resistant to high lift of hoof, twitching for flies, END HORSE 6.

Riding 1:

	Recorder 1	Recorder 2	Recorder 3	Recorder 4
Horse 1	Ears forward Head level Head neutral Ears swivel Head shake Encourage to keep walking Horse calm No adverse behaviors Working bit Ears forward Head neutral	Walking Tail swish	tail neutral, ears neutral, head is vertical to the ground, left ear forward, head shake, ears backward-forward, tail sway to the right, left ear backward, ears backward-neutral-backward,.	Neutral head, ears forward & attentive, reins currently tied to horn, moves away from rail-easily corrected, rhythmic walk-even pace, neutral head, calm tail, ears forward, neutral position of head, moved away from rail and easily corrected, licking lips, slow walk, attentive to surroundings, neutral head, swishing tails seemingly at flies, staying on rail, ears forward. END HORSE 1
Horse 2	ears back, ears forward, head tucked, pulling on rains, lowers head, ears swivel, ears forward, ears back, ears	Walking and cantering Tail swishing Ears pinned back Head stretch Play with the bit	ears backward, head is vertical to the ground, tail neutral, ears play, head up-down-up-down….ears backward, tail neutral, ears play for a long time, head up and down, mouth open, tongue lolly, tail swat to the right, ears forward-backward, walk, head is vertical to the ground, head down-up-down, ears neutral, tail neutral, blink, head shake, ear shake, tongue lolly, mouth open-close,	Nose down, tail swishing, not for flies?, ears attentive, ears attentive to rider, licking lips, stretching nose downward, holding collected, swishing tail, moved to

	out, head down, working bit, ears back, head neutral, head shake, head neutral		tail sway,	rail by rider, ears attentive to surroundings and rider, ears attentive to rider, nosing down, head up, head nuetral, dropped head, lowered head, still swishing tail, walking, neutral head, ears attentive to rider, tail swishing, walking, even gate, neutral head, END HORSE 2
Horse 3	Ears turned back Head neutral Ears forward Head neutral Horse calm Ears forward Relaxed Head neutral Ears swivel Head neutral Tail swish Horse calm Ears back	N/A	walk, ears forward, head neutral, tail neutral, back and neck in the same line, ears still, tail neutral, right ear forward, blink, left ear forward, mouth neutral, tail neutral, ears backward.	Neutral head, calm demeanor, rhythmic walk, neutral head, staying on rail, listening to rider, calm tail, walking quietly, maintaining even pace, even walk, attentive to rider, attentive to surroundings, calm demeanor, listening to rider, calm, staying on rail, relaxed movements, not sweaty, END HORSE 3

Horse 4	ears pinned back, ears still pinned, head neutral, ears turned back, extend head, pull on rains, head neutral, lower head, pull on rains, head neutral, pull on rains, ears swivel, head shake, ears pinned, mouth tense, extend head forward, pull on rains, ears forward, ears back, ears swiveling,	Walking Ears pinned back Head shake Head low	head to the left forward, ears neutral, tail neutral, ears backward-neutral, head shake, ears backward-neutral-backward-neutral-backward, ears play, jogging, ears play, head down, ears play.	Ears back, not on rail, neutral hair, ears back, nosing forward – resisting rein pressure, slowing walk, attentive to rider, "nosing out," ears back, nose out, ears back, ears back, slow walk, tail slightly lifted, ears remain back, neutral head, head up, calm transition, ears forward, ears back, ears forward, neutral head, END HORSE 4
Horse 5	Head neutral, ears forward, calm, relaxed disposition, ears forward, ears forward, relaxed, head neutral, head	Walking Tongue lolly Head shake	tail neutral, ears neutral, head neutral, head down a little-neutral, right ear backward, tail neutral, ears backward-neutral, head to the right-left-neutral, left ear backward-neutral, head to the right, tail neutral, head shake.	Calm walk, alert ears, alert eyes, head neutral, calm demeanor, ears alert, calm tail, slowing walk, neutral head, slow movements, even tail movements, ears

	neutral, ears out, ears swivel, head raised, head neutral, head raised, head raised, head neutral, head raised, head shake, working bit,			attentive to rider, calm head carry, calm tail, rhythmic walk, head up, ears alert, moved away from rail, corrected, END HORSE 5
Horse 6	N/A: recorder malfunction	Walking N/A	tail neutral, ears backward, head neutral, head up-down, right ear forward-backward, left ear forward-neutral, ears forward-neutral, tail neutral, head left-neutral-right, change movement direction, ears forward-neutral,	Fast walk, floppy ears, fast walk, head slightly bobbing, attentive to surroundings, even walk, broke walk to trot, still trotting, head toss, back to walk, floppy ears, maintain walk, moved away from rail and easily corrected, walking even pace, neutral head, fast paced walk, fast walk, attentive ears, calm tail, calm demeanor, END HORSE 6.

Riding 2:

	Recorder 1	Recorder 2	Recorder 3	Recorder 4
Horse 1	ears forward, head neural, trotting per instructor, ears swivel, ears back, encouraged to trot, ears swivel, ears swivel, ears swivel, directions changed per instructor, ears forward, ear swivel, head above neutral, head neutral, ears swivel, head lowered, head neutral, head neutral, ears swivel, pull on bit, tucked head, licking lips, ears swivel, ears	Walking Swishing Tail	tail neutral, ears forward, head is vertical to the ground, head down-neutral, head down a little bit-neutral, ears play, head down-neutral, ears play, head to the left, head down a little bit, ears play, walk, head down.	Tail movement side to side, nose tucked under, ears forward and attentive to rider, mouthing the bit, stopped mouthing bit, even gait, level head, calm eyes, relaxed mouth, tail slightly lifted, maintaining gait, ears forward, horse attentive to rider, licking lips, ears forward, nose tucked under, licking lips, horse transitioned to walk well, END HORSE 1

	swivel, ears swivel, changed to walk per instructor			
Horse 2	ears back, head neutral, ears neutral, head raised, ears scanning, ears back, head raised, ears forward, ears scanning, ears back, ears forward, ears scanning, ears forward, ears back, head neutral, tail swish, tail swish, tail swish, tail swish, ears back, head up, instructor instructed to canter, ears scanning, head	Walking Tail swishing Ears backward	ears backward, head neutral, ears forward-backward, tail neutral, ears play, head down, ears play, head up-down-up,ears play, tail sway, ears neutral, tail sway, ears play, head up, ears backward, head shake, head down, ears play, walk, head shake.	Currently walking, nose down, ears forward and alert, attentive to rider, tail swishing, head slightly up, rider corrected to collected position, ears attentive to surroundings, head bobbing, maintaining pace, tail swishing seemingly beyond pest control, nose down, ears attentive to rider and surroundings, head up, transistion to trot well, nose forward, head slightly above neutral, ears listening to rider, eyes attentive to surroundings, head neutral, slightly above neutral, walking, walking, collected, walking, END HORSE 2

	elevated, ears back, changed to walk per instructor, ears back, ears back, ears scanning, head neutral			
Horse 3	ears back, head neutral, ears back, head elevated above neutral, head neutral, ears back, head neutral, instructor moved them to trot, ears forward, head neutral, ears back, ears back, ears forward, ears back, ears back,	N/A	ears neutral, head neutral, tail neutral, ears backward-neutral, right ear forward-neutral, ears play.	Neutral position, calm mannered, head quiet, eyes calm, ears listening to rider, tail slightly lifted and calm, maintaining even pace, head neutral, jaw movement, ears attentive to rider, head slightly above neutral, tail calm, head neutral, tail lifted slightly higher, calm demeanor, head neutral, calm mouth, even pace, END HORSE 3
Horse 4	ears back,	Cantering and	ears backward,	Currentlly loping, ears are back towards rider, correct

	steady lope per instructor, ears pinned, approached another horse, ears pinned back, changed to walking, snorting, ears pinned, licking lips, relaxed mouth, cough, licking lips, head low, head neutral, ears forward, pulling at bit, ears back, head neutral, deep breath, sigh, ears back, head neutral, ears swivel, ears swivel, moved to lope per instructor, ears back.	walking Ears back Tongue lolly	head pulling a little bit, tail neutral, walk, head down, tongue lolly, groan, abnormal oral behavior, head up a little bit, ears play, ears backward, ears play, ears backward.	lead, head slightly above neutral, ears back towards rider, horse appears tense to calm, transistioned to walk, pulled against bit, lowered head, licking lips, licking lips, listening to instructor, nose up and out, licking lips, eyes calm, ears neutral, picked up pace, head up, ears forward, head up, ears forward, nose out, transitioned to lope well, nose out, END HORSE 4
Horse 5	N/A	Running and walking	ears neutral, head neutral,	Currently loping, head raised, ears forward, fast pace, fast pace, tense neck, ears forward, ears back listening

			ears plays, ears backward, walk, head sway a little bit, ears play, head up a little bit, ears play, tails play, ears play.	to rider, slow transition to walk, licking lips, licking lips, licking lips, neutral head, walking quietly, ears forward, ears back towards rider, head neutral, slightly above neutral, calm demeanor, moving along rail, walk, calm head position, maintaining gait, attentive to rider, neutral head, maintaining gait, attentive to surroundings, END HORSE 5
Horse 6	ears back, ears back, ears forward, head neutral, walking, horse elevated its pace to trot, rider corrected pace, head neutral, ears forward, ears back, head raised, ears back, head neutral, ears back, ears forward, ears swivel, ears back, ears back, head neutral, ears	Walking Ears back	head neutral, ears forward, tail neutral, head up a little bit, ears neutral, ears play, head up a little bit--neutral, ears play, ears neutral, tail neutral, right ears back ward-forward, ears forward, ears play.	Head vertical movement, neutral tail, ears attentive to surroundings and rider, broke gait transistioned to trot, back to walk, lifted head, energized personality, broke gait to trot, rider brought horse back to walk, maintaining even gait at walk, changing pace, ears attentive to rider, trying to break into trot, trying to break gait into trot, calm tail, licking lips, slight head bobbing, calm gait, walk, quickened pace, END HORSE 6

	forward, ears back, ears back			

Riding 3:

	Recorder 1	Recorder 2	Recorder 3	Recorder 4
Horse 1	ears forward, head tucked, ears forward, ears back, blow, working bit, head neutral, ears forward, ears scanning, head neutral, head neutral, ears scanning, ears back, ears back, ears swivel, pull on rains,	N/A	head flexed, ear neutral-forward-neutral, tail neutral, heavy breath? Neck to the right a little bit, head down, ears play, tail neutral, ears play, ears neutral, head neutral, ears play, head down-neutral,ears play.	Nose, head in correct position, slow jog, collected, tail swishing slightly beyond normal, slow jog, incredibly slow jog, head neutral position, ears attentive to rider, nose down, slow movements, horse transitioned to faster speed evenly, tail more raised than before, sweaty in buttocks, horse attentive to rider, generally calm, horse slowed to very slow jog, horse is collected as requested by rider, END HORSE 1
Horse 2	head neutral, turned head, ears back, head neutral, head neutral, ears scanning, no adverse behaviors, calm, ears	Walking Tail swishing	head neutral, eyes to the ground, ears forward, head to the right, tail sway, head down, ears play, head up, ears backward-neutral, head	Horse collected at walk, tail swishing seemingly not to combat flies but does not appear irritated, ears attentive to rider, horse is walking calm and collected, tail still swishing, does not appear agitated, tail seems more excessive than a normal movement, horse is calm, ears relaxed, ears attentive to rider, tail swishing, ears attentive to rider nose lowered by rider, transitioned into trot slowly, head slightly above neutral, nose slightly out, corrected by rider, listening

	back, ears scanning, head turned, ears scanning, head neutral, head raised, head lowered, head neutral, instructed to trot, ears back, head elevated above neutral, head raised, head raised, ears forward, head raised head lowered, head lowered,		down, ears neutral, tails sway, ears play, little sound, ears play, ears backward, head up-neutral-up-neutral-down, ears play.	to rider, nose down, END HORSE 2
Horse 3	head neutral, ears forward, head raised, encouraged to jog, ears swiveling, ears back, ears back, head neutral, head raised, ears swivel, head	Walking Ears backwards	ears neutral, head neutral, tail neutral, head up a little bit, ears play, head up a little bit, ears play, ear neutral, tail neutral, ears play, ears neutral, ears	Nose up, licking lips, nose forward, nose up, nosing forward, ears back, ears slightly-listening to rider, nose forward, nose forward, head slightly above neutral, even jog pace, calm demeanor, calm demeanor, head in neutral position, tail slightly raised and calm, nose bobbing, head slightly up, head neutral, same personality, ears attentive to surroundings and rider, END HORSE 3

	raised, ears scanning, ears back, ears back, ears back, ears back, horse relaxed, ears forward, ears swiveling, ears forward, ears forward, ears swiveling, encouraged to maintain canter.		play, .	
Horse 4	ears out, head neutral, ears forward, head neutral, ears back, ears back, ears back, ears back, head neural, head neutral, head neutral, pulling at bit, licking lips, ears back, ears	Walking Swishing tail Tongue lolly Grinds teeth Ears backward	head neutral, ears neutral ,tail neutral, ears play, tail sway, ears play, tail neutral, head down a little bit, tongue lolly, abnormal oral behavior, ears play.	Horse sweating neck, shoulders, buttocks, chest. Tail slightly raised, ears back, pushing nose out, pushing nose out, appears stiff in hind end, neutral head, calm at walk, nose out and forward to resist rein pressure, licking lips, nosing out to resist rein pressure, ears back, appears slightly irritated, ears attentive to surroundings, neutral head END HORSE 4

	forward, ears back, ears neutral, head neutral			
Horse 5	ears forward, head neutral, ears forward, head neutral, head shake, head elevated above neutral, horse calm, head neutral, ears out, ears scan, ears forward, head neutral, calm disposition, ears forward, ears forward, head neutral, head turn, ears forward, ears out, head neutral, head neutral	Walking Head shake	ears forward, eyes to the ground, head neutral, tail neutral, ears play, head up-neutral-right-neutral, ears neutral, head right-neutral, ears play.	Currently walking, calm, ears attentive to surroundings and rider, tail calm, attentive to rider, head slightly above neutral, tail swishing seemingly for flies, ears listening, horses head neutral, slowing into walk, attentive to rider and surroundings, head in neutral position, tail calm, walking calmly, attentive to surroundings, horse calm, maintain slow walk in neutral head position, ears relaxed, END HORSE 5
Horse 6	ears forward,	Walking	head neutral,	Head neutral, ears calm, slightly floppy, light head

	head neutral, ears scanning, head neutral, head neutral, ears forward, scanning, ears back, head neutral, head neutral, ears back, ears forward, head raised above neutral, ears forward, head neutral, head neutral,	N/A	ears neutral, tail neutral, ears play, ears play, head up little bit, head neutral, tail neutral, ears neutral, circle move, ears play, head to the right a little bit.	bobbing, quickened walk, ears slightly floppy, tried to break gait x 2, licking lips, licking lips, licking lips, neutral head, head neutral, tail calm, holding neutral position, head neutral, END HORSE 6

Untacking:

	Recorder 1	Recorder 2	Recorder 3	Recorder 4
Horse 1	ears scanning, head lowered, being groomed, licking lips, licking lips, ears forward, head alert, looking out window, head	Head low Tongue lolly	tail still, head down, ears neutral, abnormal oral behavior, head up to neutral, back shake, ears forward, nose bigger, ears play,	Sensitive to brushing, bobbing, playing with tongue, attentive to view outside, reactive to flies, head lowered, licking lips, agreeable for hoof raising, head lowered, END HORSE 1

	lowered, ears scanning, ears scanning, cleaning hooves, head lowered, ears scanning, relaxed, ears back, ears forward		abnormal oral behavior, head down, ears play.	
Horse 2	unsaddled already, head neutral, ears out, ears scanning, take step, head neutral, smelling tack, head raised, tail swishing, tail swish, head raised, watching riders, calm but alert, tail swish, tail swish, head neutral, calm, head neutral,	Ears backwards Swishing tail	ears forward, tail neutral, stand still, head to the right, back shake, tail sway, ears forward ,ears play, head to the right, ear neutral, ears play, tail neutral, left ear neutral.	Head neutral, already untacked, tail swishing, reactive to flies, ears forward, calm eyes, ears forward, ears forward, eyes calm, tail still, tail moving slightly, ears forward, not tied to rail, END HORSE 2

	ears scanning, head rise.			
Horse 3	during grooming, ears back, ears forward, head turned, head turned, pick back foot up and stepped, ears turning, head raised, head turn, ears turned, ears scanning, head raised, cleaning hooves, ears back, ears forward, ears scanning, head turned,	Ears back	head to the left, ears backward, ears play, head up, ears play.	Ears attentive to groomer, horse head looking back at groomer, does not appear fully relaxed, head raised, attentive to surroundings, head raised, allows hoof to be picked up, ears forward, ears attentive to groomer
Horse 4	head raised, ears back, foot cocked, ears back, ears scan, ears	Tongue lolly	left hind leg bend, ears backward, ears play, left hind toe on the	One leg cocked, ears back, tail quiet, head and neck not relaxed, head slightly up, head slightly raised, extra sweaty, calm, ears relaxed, cocked opposite leg, remaining same, ears attentive to suroundings

	forward, ears scan, ears back, licking lips, licking lips, chewing, ears back, cocked at hip, tail flick		ground, left ear play, right hind toe on the ground, tongue lolly, abnormal oral behavior, right ear play, head shake, ears neutral.	
Horse 5	head extended, licking lips, yawned, tail flick, tail flick, tail flick, ears netural, tail flick, ears neutral, tail flick, tail flick,	Tail swishing Grinds teeth	tail sway, left ears backward, tail sway, head down, still, ears neutral, quiet, shoulder shake, right hind leg bend.	Yawning, tongue out, licking lips, slightly reactive to flies, slightly unsheathed, ears attentive to surroundings, one leg cocked out, calm and quiet, still relaxed, tail swishing for flies
Horse 6	ears back, tail raise, ears back, stretching mouth, yawning, ears neutral, ears out, ears back, licking lips, looking	Open and close mouth Ears back	ears play, tail raise, chewing, tail sway, head to the left, tail play, ear erect, head forward, tail play.	Horse calm, opened mouth to release bit, licking lips, yawning, ears attentive to rider, skin twitching, relaxed, twitching, relaxed, remaining same, slightly sleepy, licking lips

	around, head turned, ears back, licking lips			