

EQUINES DO NOT LIVE FOR GRASS ALONE: TEACHING  
EQUINES WITH SOCIAL INTERACTION

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Thesis Prepared for the Degree of  
MASTER OF SCIENCE

UNIVERSITY OF NORTH TEXAS

May 2020

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Nishimuta, Maasa. *Equines Do Not Live for Grass Alone: Teaching Equines with Social Interaction*. Master of Science (Behavior Analysis), May 2020, 42 pp., 7 figures, 1 appendix, references, 27 titles.

Most horse training methods heavily rely on negative reinforcement and punishment. However, there is a movement in the horse community to utilize positive reinforcement to meet training goals. Although food has been used effective as a reinforcer with horses, social interaction has also been demonstrated to function as a positive reinforcer for animals. Utilizing social interaction as a reinforcer may lead to several benefits for both the trainer and animal. Some of the benefits can be improved relationships between animals and their caretakers and improved animal welfare. The purpose of this study was to apply Owens and Owens et al. previous research protocols to three equines to assess if social interaction, in the form of petting and gentle scratching, would function as a reinforcer. Using a changing criterion design, this study demonstrated that petting and gentle scratching could function as a reinforcer to teach three equines to stay and come in their natural environment.

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## ACKNOWLEDGEMENTS

Special thanks to Dr. Jesús Rosales-Ruiz for his guidance and support throughout my undergraduate and graduate programs and allowing me to pursue my interest; my partner, Sean Will, for helping me run the study and supporting me throughout the study. I am looking forward to our future work to disseminate Constructional Affection to the world. I want to thank my committee, Dr. Shahla Ala'i and Dr. April Becker for your helpful feedback; Joanne Robbins and Mary Hunter for editing the manuscript; Isabel Cunningham for her input on how to assess the quality of interaction between equines and humans; all the animals, Peepers, Jackson, Phillip, Claudius, Sancho, Castor, and Sebastian, for teaching me the power of social interaction to build mutually reinforcing relationships; and the local horse rescue in North Texas for allowing me to train their equines.

I would also like to thank the Department of Behavior Analysis at the University of North Texas for this wonderful educational experience and my family for supporting me throughout my study abroad in the United States.

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## INTRODUCTION

Traditional horse training has primarily relied on negative reinforcement and punishment (McLean, 2005). However, a major revolution in horse training began in the last two decades of the 20<sup>th</sup> century. Methods that have been labeled as more humane, such as natural horsemanship, were developed and taught in many countries (Dorrance, 1994; Miller, 2007; Parelli, 1993; Roberts, 1998). However, even though natural horsemanship can be more humane than traditional horse training, it still uses aversive control (Birke, 2007). In most forms of traditional horse training and natural horsemanship, the trainer applies pressure with his or her hands, a lead rope, whips, or other equipment, and removes the pressure when the horse performs the criterion behavior. When the horse does not perform the criterion behavior, the trainer may apply pressure with more intensity or frequency until the horse performs the desired behavior (Parelli, 1993). Training that uses negative reinforcement and punishment can produce side effects, such as undesirable emotional states, aggression, and escape from people or other parts of the environment that are associated with the aversive stimuli (Azrin & Holz, 1967). Yet, the use of aversive control is prevalent in the horse community because it can lead to immediate results, matches the societal practices that focus on aversive control with human behaviors, and supports a common belief that the human must dominate the horse to gain respect.

The use of positive reinforcement, as pioneered by B.F. Skinner, was introduced to animal training in the middle of the 20<sup>th</sup> century (Breland & Breland, 1951; Breland, Breland, & Bailey, 2018; Skinner, 1953). By the last decades of the 20<sup>th</sup> century, these methods were beginning to be adopted widely by dog and zoo trainers. (Breland et al., 2018; Pryor, 1999; Ramirez, 1999; Rollin, 2000). However, it is only in the past two decades that horse trainers have really begun to apply positive reinforcement methods (Karrasch, Karrasch, & Newman, 2000;

Kurland, 2003). The shift to positive reinforcement has been considered to improve animal welfare in many species, including horses (AVMA Animal Welfare Forum 2000; Boissy et al., 2007; Laule, Bloomsmith, & Schapiro, 2003). For example, Innes and McBride (2008) found significant behavioral differences when rescued ponies were trained with positive reinforcement methods. In particular, the ponies were more willing to participate in training and showed more exploratory behavior in novel environments. In another study, Hendriksen, Elmgreen, and Ladewig (2011) found that horses learned to load onto a trailer faster and exhibited less stress responses when positive reinforcement was used.

Animal trainers who use positive reinforcement methods primarily use food as a reinforcer. However, social interaction and attention can also function as reinforcers for animals. Dogs often jump on people to get attention or climb in a person's lap to cuddle. Pet parrots can learn to scream to gain their owner's attention. Equines commonly approach, nibble, or push people to get attention.

Previous studies with animals have demonstrated that social interaction can function as a reinforcer. For example, Falk (1958) showed that chimpanzees discriminated stimuli that resulted in having access to a longer duration of grooming a human's arm. Other studies have shown that animals commonly engage in behaviors that people label as problem behaviors in order to have access to people. For example, Dorey, Rosales-Ruiz, Smith, and Lovelace (2013) demonstrated that a captive olive baboon engaged in self-injurious behavior in order to gain attention from humans. Treatment involved using human attention to reinforce an alternative response. In another study, Owens, Katz, Will, Belcher, Cox and Rosales-Ruiz (2013) demonstrated that dogs jumped on people in order to gain attention from the trainer, even though



the access was brief. In the second half of the study, Owens et al. (2013)<sup>1</sup> used social interaction to establish calm behaviors and teach ideal social interactions between dogs and human. The trainer stroked or scratched the dog contingent on the dog sitting, which resulted in an immediate shift from jumping to sitting in two dogs. In a related study, Owens (2017) used petting and scratching to teach new, appropriate behaviors to three dogs that engaged in unwanted behaviors. One benefit of this type of social interaction is that the trainer always has the reinforcer available and does not need to carry treats or toys. Also, tapping into natural communities of reinforcement may help facilitate generalization (Ferster, 1972; Stokes & Baer, 1977)

However, in recent research studies, the reinforcing effectiveness of social interaction on an animal's behavior has been called into question (Feuerbacher & Wynne, 2012; Sankey, Henry, Górecka-Bruzda, Richard-Yris, & Hausberger, 2010). Sankey et al. (2010) compared the reinforcing effectiveness of food and grooming to train horses to stay on cue. All of the food-rewarded horses learned to stay for 1 min on cue in 6 days, whereas only 4 out of 10 groom-rewarded horses mastered the same behavior. During the post-test, food-rewarded horses approached sooner and stayed longer with the experimenter than the groom-rewarded horses. Although the study concluded that food was a more effective reinforcer than grooming, the study had several limitations. In particular, the groom-rewarded horses received three scratches on their withers as a reward. In contrast, normal grooming interactions in horses generally vary in length and location.

In another study, Feuerbacher and Wynne (2012) compared the reinforcing effectiveness between treats and social interaction in dogs. They measured the latency and frequency of nose touches in three conditions: treats, social interaction, and extinction. During the food condition,

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<sup>1</sup> For more information, see [constructionalaffection.com](http://constructionalaffection.com).

dogs had a higher frequency and shorter latency of nose touches than during the social condition. However, as in the Sankey et al. study (2010), the social interaction condition involved the experimenter scratching the dog for around 4 sec on the dog's neck while delivering verbal praise. This lacks the natural component of petting and scratching that is usually seen in human and dog interactions where petting and scratching varies by location, intensity and length. Although there are controversies on the effectiveness of social interaction as a reinforcer for animals, Owens et al. (2013) and Owens (2017) experimentally demonstrated that social interaction can function as a reinforcer for dogs. Thus, the aim of the current research study was to extend the procedures used by Owens et al. (2013) and Owens (2017) to equines and to see if social interaction could be used as a reinforcer to teach three equines to stay and come on cue.

## METHOD

### Participants

Three equines served as participants in the study. All three participants lived at a local horse rescue in North Texas. Two of the participants were horses, and the other participant was a mule. All participants met the pre-assessment criteria.

Claudius is an 8-year-old, Hackney pony gelding. The participant was halter-trained, trained to be ridden, and had some groundwork. Groundwork refers to exercises the trainer does with the horse when the trainer stays on the ground. This involves engaging the horse in different kinds of movement with the use of the halter, lead rope, or whip. It was also reported that Claudius had been trained to pull carts. Before the study, Claudius approached people for interaction and let people scratch him all over his body, but avoided being hugged around the neck.

Sancho is a 2-year-old, ungelded, miniature mule. Sancho was three months old when rescued. When he was rescued, he had a disease called strangles and was so underweight that the owner could feel his ribs. He was treated for strangles and recovered fully. Sancho had no training history. Before the study, Sancho approached and followed people around for interaction, but was reported to be difficult to train and didn't follow commands.

Castor, a 4-year-old, Haflinger gelding, was purchased at a horse auction. Castor was halter-trained and had 5 days of riding training. The owner purchased him 2 years before the study. When the trainer first purchased him, Castor stayed away from people and was hard to catch in the pasture. Eventually, Castor turned out to be a horse who approached and stayed with people for interaction. However, if the person did not interact with him (e.g. sat by the hay bale), Castor would nibble or bite at the person's hip or leg for interaction.

## Setting and Materials

This study was conducted at a local horse rescue in North Texas. All sessions were conducted in an outside pasture where the participants lived with other equines. The participants had access to trees, round hay bales, grass, and water at all times. Claudius and Castor lived in the same 10-acre pasture, and the number of equines in the pasture ranged from 4 to 14. Sancho lived in another pasture that was about one acre. Between 4 to 10 equines lived in this pasture with Sancho in addition to one cow. The trainer visited the participants in the morning between 9 a.m.-11 a.m. and/or in the evening between 4 p.m.-7 p.m.

To minimize distractions and help make the participants more comfortable, the trainer looked for an area in the pasture with good shade and with few sticks, rocks, muddied spots, or droppings to conduct the sessions. While training, the environment could change in ways that might distract the participant. For example, since the trainer did not separate the participant from the herd for the training session, sometimes several equines would approach and greet the trainer and the cameraman. Other potential distractions included the movements of the cameraman, the neighboring farmer's tractor, and the dogs that lived on the property getting close to the participants. Although the trainer began the training session in one part of the pasture, the horse was free to move around the pasture.

One cameraman accompanied the trainer to help with the recording and arranging the environment for the participant, including keeping the visiting equines away from the participant. All the sessions were recorded with two video cameras. For Claudius's and Castor's pasture, one video camera was located outside the pasture at a fixed angle to capture a zoomed-out perspective, and the cameraman brought the other video camera inside the pasture to capture a zoomed-in perspective of the interaction between the trainer and the participant. For Sancho's

pasture, two video cameras were located outside the pasture, and the cameraman manipulated the angles of the video cameras from outside the pasture to capture two different angles. The trainer wore an Apple watch and used it as a timer.

### Measurements

A total of 13 behaviors were recorded for all participants. In addition, total training time was also measured. Many of the definitions use the phrase “within proximity,” which meant the trainer was close enough that if she took one step, she could extend an arm and touch the participant.

The dependent variables of approach, cuddle, interaction, and nuzzle were measured as cumulative duration. These behaviors were defined as follows:

- *Approach*: An approach began when the participant was out of proximity and ended when the participant was within proximity.
- *Cuddle*: A cuddle began when any part of the participant’s body (except the mouth/nose area) contacted any part of the trainer’s body and ended when the contact was broken. If any part of the participant’s body made contact with the trainer’s body and resulted in the trainer losing balance and moving her feet, this was no longer considered a cuddle.
- *Interaction*: An interaction began when the participant came within proximity and ended when the participant or the trainer was no longer within proximity.
- *Nuzzle*: A nuzzle began when the participant’s closed mouth, nose, or lower part of the participant’s face contacted any part of the trainer’s body and ended when the contact was broken between the mouth/nose area and the trainer’s body.

The dependent variables of bite, leave, nibble, offer, push, and walk away bite were measured as cumulative frequency. These behaviors were defined as follows:

- *Bite*: A bite was defined as the participant's opened mouth moving toward the trainer and/or the opened mouth or the teeth making contact with any part of the trainer's body. If the horse made contact with the trainer, the behavior ended when the contact was broken.

- *Leave*: Leave occurred when the participant was in proximity and then moved away so that they were no longer within proximity.

- *Nibble*: A nibble was defined as the participant's lips moving on any part of the trainer's body. An instance of this behavior started when the lips began to move and ended when the lips stopped moving.

- *Offer*: While being petted, an offer occurred if the participant moved their body in a manner that brought a new body part within proximity, but without pushing the trainer.

- *Push*: A push was defined as the participant moving toward and/or making contact with any part of the trainer's body that resulted in the trainer losing balance and having to move her feet.

- *Walk away*: Walk away was defined as the participant leaving the area without ever approaching the trainer during the session.

Two additional behaviors, come and stay, were also measured. The dependent variable for these behaviors was successful and unsuccessful trials. These behaviors were defined as follows:

- *Come*: A successful come was defined as when the trainer walked away and provided a come cue, and, within 5s after the cue, the participant moved its body toward the trainer's hands or moved one leg toward the trainer and continued moving until it had approached within proximity. An unsuccessful come was defined as when the trainer walked away and provided a

come cue, the participant kept all four hooves on the ground for more than 5s after the cue, or walked away from the trainer.

- *Stay*: A successful stay was recorded when the trainer removed hands or provided a stay cue and walked away, and the participant kept at least three hooves on the ground at all times until the trainer returned within proximity of the participant. An unsuccessful stay was defined as when the trainer removed hands or provided a stay cue and walked away, and the participant moved more than one hoof simultaneously, or walked away or toward the trainer.

Lastly, the total training time referred to the duration of time spent in the training conditions. This included the following phases, which are defined below: reinforcement system training, first phase of stay, second phase of stay, training a come, and training stay and come combined.

### Recording

All trials were videotaped with a video camera on a tripod. Data were taken from the video recordings.

### Reliability

An observer was trained to record interobserver agreement data (IOA) from video recordings of the training sessions. The observer was the owner of Claudius and Castor and was a horse trainer who worked at the rescue. Before collecting IOA data, the observer was given a presentation that taught the definitions of nine behaviors (i.e., approach, bite, cuddle, interaction, leave, nibble, nuzzle, offer, and push) and gave examples and nonexamples of each behavior. After the presentation, the trainer explained how to record data on the data sheet. Then, the observer watched practice videos and practiced taking data. The observer was given another presentation that demonstrated successful and unsuccessful trials of the behaviors on cue (i.e.,

come, stay, and come and stay combined). After the presentation, the observer watched practice videos and practiced taking data. After the practice, the trainer clarified additional questions with the observer, provided the data sheet, and set up the IOA video on a computer. The observer was instructed to pause the video and watch it multiple times if needed.

The videos for IOA were randomly selected from each participant and from each experimental condition. However, if part of the video included moments off camera or angles that were difficult to observe, it was not included for IOA. 30% of the total videos were selected for IOA.

IOA was calculated based on the behavior. Mean duration-per-occurrence was used to calculate the IOA for duration behaviors, which included approach, interaction, nuzzle and cuddle. The formula was  $(\text{Dur IOA R1} + \text{Dur IOA R2} + \text{Dur IOA Rn}) / n \text{ responses with Dur IOA}$  multiplied by 100. IOA was 91% for approach, 98% for interaction, 88% for nuzzle, and 70% for cuddle. Cuddle was difficult to observe on some trials because of the location and angle of the camera. This led to lower IOA for this behavior. Mean count-per-interval was used to calculate IOA for frequency behaviors, which included offer, leave, push, nibble, and bite. The formula was  $(\text{Int 1 IOA} + \text{Int 2 IOA} + \text{Int N IOA}) / n \text{ intervals}$  multiplied by 100. (In this study, an interval was a trial.) IOA was 84% for offer, 100% for leave, 100% for push, 100% for nibble, and 100% for bite. Total count was used to calculate IOA for the behaviors on cue, which included stay, come, and stay and come combined. The formula was  $(\text{smaller count} / \text{larger count})$  multiplied by 100. For these behaviors, the IOA was 100% for stay, 89% for come, 98% for stay and come combined.

### General Procedures

The trainer and the cameraman visited the participants in their natural setting nearly



every day. On each visit, the trainer conducted at least one training session per participant and at most two sessions. Training sessions were not conducted on days when there were thunderstorms or when new horses were added to the herd. This is because participants would not reliably approach the trainer under these conditions.

At the beginning of each session, the trainer entered the pasture, faced the participant, and waited for the participant to approach within proximity. If the participant did not approach within 2 min, the trainer did not conduct the session. When the participant approached within proximity, the trainer began petting or scratching the participant and continued for at least 1 min. Next, the trainer started the timer to start the session. After the session was completed, the trainer would end the session by petting or scratching the participant for at least 1 min.

During a session, if the environment changed in a way to be disruptive to the participant (i.e., if the dogs were running around near the participant, other equines were visiting and greeting the trainer, the tractor was running at a neighbor's farm, etc.), the trainer guided the participant to a different area in the pasture and continued the session. However, if the dogs stayed in close proximity to the participant or if it was otherwise difficult to continue the session, the trainer would end the session. If the participant was crowded by other equine(s), the trainer assessed if they could continue the session. The trainer would wait for the other equines to walk away, or the cameraman would attempt to pet and scratch the visiting equine(s). If the other equine(s) stayed with the cameraman, the trainer continued the session. If the other equine(s) approached and pushed the participant away, the trainer walked to a different spot and waited for the participant to approach to continue the session. If the participant did not approach the new spot, the trainer ended the session. During the session, if the participant left or walked away for 2 min, the trainer ended the session. Sometimes, there were potentially dangerous situations while

the trainer and the cameraman were in the pasture. These situations included when the equines started to bite, push, or became aggressive with each other or toward the trainer or the cameraman. If this happened, the trainer and the cameraman immediately ended the session and left the pasture.

Outside the training session, the trainer, the cameraman, and the people who worked at the horse rescue interacted with the participants as usual. However, no other training was conducted with the participants during the duration of this study.

There were nine experimental conditions in the study. They were conducted in this order: Pre-assessment, reinforcement system training, baseline of stay, first phase of stay, second phase of training a stay, baseline of come, training a come, training a stay and come combined, and post-assessment. Each condition is described below.

## Procedures

### Pre-Assessment

The pre-assessment determined if participants had the appropriate entry repertoires to participate in the study. The trainer conducted 10 pre-assessment trials with each equine. This included 5 trials on one day and an additional 5 trials on a second day.

A trial began when the participant approached within proximity. When this happened, the trainer presented her hands in front of her, palms up toward the participant. This open-hands gesture was used to signal that the trainer was about to begin petting and scratching the equine with one or two hands on any part of the participant's body within proximity. The trainer then reached toward the participant and used two hands to pet or scratch any part of the participant's body that was within proximity for 2 min. The trainer continued to pet or scratch as long as the participant stayed within proximity or when the participant nuzzled, cuddled, pushed, or nibbled

the trainer, or offered different part of the body to be petted or scratched. While the participant was within proximity and/or being petted or scratched, the trainer talked to the participant gently, using words such as “good boy” or “way to go.” If the participant tried to bite, the trainer stopped petting or scratching and took a step back. If the participant stopped biting and stayed within proximity, the trainer made the open hands gesture and resumed petting and scratching with two hands for the rest of 2 min. Because the intention was to assess the current repertoire, the trainer allowed the participant to push or nibble and continued to pet or scratch if these behaviors occurred. After 2 min, the trainer ended the trial by taking three steps back while facing the participant. The next trial began when the participant approached within proximity.

The equine was selected for the study if it approached the trainer within 2 min and stayed within proximity for 2 min for all 10 trials.

### Reinforcement System Training

The purpose of the reinforcement system training was to teach the equine to stay within proximity while the trainer petted and scratched the equine and without pushing, nibbling, biting or walking away. A trial began when the participant approached or stayed within proximity and the trainer made the open hands gesture. The trainer then reached out with one hand and petted or scratched any part of the participant’s body that was within proximity for 5 s. After 5 s, the trainer added a second hand and continued petting the participant for 1 min. While the participant was within proximity and/or being petted or scratched, the trainer talked to the participant gently, using words such as “good boy” or “way to go.” At the end of 1 min of petting or scratching, the trainer ended the trial.

If the participant cuddled, nuzzled, or offered during a trial, the trainer kept petting or scratching until the end of the trial or when the participant engaged in push, nibble or bite. The

participants sometimes offered different parts of the body to change the area the trainer was petting or scratching. When the participant stopped moving, the trainer would pet or scratch the new part of the body that was within proximity.

If the participant pushed, nibbled, or bit the trainer during a trial, the trainer stopped petting or scratching and took a step back. If the participant stopped engaging in the behavior and stayed within proximity, the trainer started a new trial by showing opened-hands gesture to the participant. This rule about push, nibble and bite applied to the rest of the experimental conditions except the pre- and post-assessment. During pre- and post-assessments, the trainer stopped petting or scratching only when the participant bit. The trainer allowed the participant to push or nibble the trainer.

The trainer continued working with the participant in the same spot until there was one successful trial. A successful trial was when the trainer petted or scratched with both hands any part of the participant's body continuously for 1 min without the participant engaging in any of these behaviors: push, nibble, bite, or leave.

After achieving a successful trial, the trainer walked 5 steps back while facing the participant and waited for the participant to approach to begin the next trial. The trainer ended a session when the mastery criterion was met, when 10 min had passed, or when the participant walked away or stayed away from the trainer for 1 min. If, at the end of 10 min, the trainer was petting or scratching the participant, the trainer ended the session after the trainer completed the trial.

The trainer continued this procedure until there were three consecutive successful trials. That is, for 3 trials in a row, the participant approached the trainer within 2 min and stayed within proximity continuously for 1 min without pushing, nibbling, biting or leaving. After

reaching the mastery criterion, the participant moved on to the next condition, a baseline of stay.

#### Baseline: Stay

The baseline of stay condition tested whether the equine would follow the trainer or stay in one spot when the trainer walked away. A trial began when the trainer said “stay” and made a stop gesture near the participant’s face with one outstretched hand. The trainer then turned away from the participant, walked 5 steps, turned back to face the participant, and paused for 10 s. The trainer walked in different directions on each trial.

If the participant stayed in the same spot for 10 s, the trainer showed the opened hands gesture toward the participant, walked back to the participant, and petted or scratched with both hands any part of the participant’s body that was within proximity for 1 min. If the participant approached within proximity of the trainer, the trainer oriented to the participant and petted or scratched with both hands any part of the participant’s body that was within proximity for 1 min. If the participant walked toward the trainer and then stopped, the trainer walked to the participant and petted or scratched for 1 min. If the participant walked away and stayed away for 2 min, the trainer ended the session. The trainer conducted five trials per day for two days.

#### First Phase: Stay

Training a stay was divided into two parts. In the first phase, the trainer taught the participant to stay for 10 s while the trainer was in proximity but not touching the participant.

A trial began when the trainer moved both hands away from the participant. A successful trial was when the participant kept at least three hooves on the ground until the trainer returned her hands. When the trainer returned her hands, she petted or scratched any part of the participant’s body that was within proximity for 20-30 s. After one successful trial, the trainer moved to the next shaping step. However, in some cases, if the environment was distracting for

the participant (e.g., other equines crowded or stayed near the participant, the dogs ran around the participant, etc.), the trainer repeated that shaping step two or three times. This was also true for the rest of the conditions.

A trial was unsuccessful if the participant moved more than one hoof simultaneously, left, or walked toward the trainer. After an unsuccessful trial, the trainer waited for the participant to stop moving. The trainer then petted or scratched for 10 s and repeated the same shaping step on the next trial. If there were two consecutive unsuccessful trials, the trainer returned to the previously successful step on the next trial.

Every session started with two or three trials of the previously successful shaping step. The Appendix describes the twelve shaping steps for the first phase of training a stay. Shaping step #1 was that the trainer moved her hands in front of her chest and immediately return back to petting or scratching the participant. In shaping steps #2 to #12, the trainer built duration up to 10 s while the trainer stood next to the equine with her hands at her sides. The mastery criterion for this phase of the study required three consecutive successful trials at the final step (duration of 10 s).

#### Second Phase: Train a Stay

In this phase, the trainer added a stay cue and gradually increased distance and duration until the trainer could take 5 steps and pause for 10 s.

A trial began when the trainer presented the stay cue and took steps away from the participant. The stay cue was the trainer saying “stay” and making a stop gesture near the participant’s face with one outstretched hand. A successful trial was when the participant kept at least three hooves on the ground until the trainer showed the open-hands gesture after the designated amount of time. The trainer then walked back to within proximity of the participant

and petted or scratched for 30-50 s with two hands on any part of the participant's body that was within proximity. After one successful trial, the trainer moved to the next shaping step.

A trial was unsuccessful if the participant moved more than one hoof simultaneously, left, or walked toward the trainer. After an unsuccessful trial, the trainer waited for the participant to stop moving. The trainer then presented the stay cue and repeated the same shaping step on the next trial. If there were two consecutive unsuccessful trials, the trainer returned to the previously successful step on the next trial.

Every session started with 2 or 3 trials of the previously successful shaping step. The appendix describes the sixteen shaping steps for the second phase of training a stay. Shaping Step 1 was that the trainer stepped backward with only one foot and then immediately returned to the original position and resumed petting or scratching the participant. From Shaping Steps 2 to 11, the trainer increased the duration to 10 s while standing one step away. From Shaping Steps 12 to 16, the distance was increased to the final criteria of 5 steps. During these steps, the duration was first lowered back to 3 s and then gradually increased to 10 s. The trainer required three consecutive successful trials at Shaping Step 6 (one step and 5 s), Shaping Step 11 (one step and 10 s), and the final Step 16 (5 steps and 10 s) before moving on. The trainer petted or scratched for 1 min after each successful trial in the last step (5 steps and 10 s).

Baseline: Come

This condition tested whether the equine would follow the trainer or stay in one spot when a come cue was given. A trial began when the trainer presented the stay cue. The trainer then turned away from the participant, walked 5 steps, and paused for 5 s. The trainer walked in different directions on each trial. During the 5 s, the trainer gradually turned her body 180 degree

until she faced the participant. After the 5 s, the trainer said “come,” waved one hand near her face, and waited for an additional 5 s.

If the participant stayed in the same spot for 5 s after the trainer gave the come cue, the trainer showed the open-hands gesture, walked back to the participant, and petted or scratched the participant with both hands on any part of the participant’s body that was within proximity for 1 min. If the participant approached within proximity of the trainer during this interval, the trainer oriented to the participant and petted or scratched with both hands on any part of the participant’s body that was within proximity for 1 min. If the participant walked toward the trainer and then stopped, the trainer waited until the 5 s had elapsed, walked back to the participant, and petted or scratched for 1 min. If the participant walked away and stayed away for 2 min, the trainer ended the session. If the participant walked to the trainer before the trainer presented the come cue, the trainer waited until the participant stopped and stood straight, and then represented the stay cue. This counted as a continuation of the same trial, not as a new trial. The trainer conducted five trials per day for two days. All ten trials contained one come cue.

#### Train a Come

In this condition, the trainer taught the participant to approach within proximity of the trainer within 5 s of the presentation of the come cue.

A trial began when the trainer took steps away from the participant and presented the come cue (appropriate to the shaping steps). A successful trial was when the participant moved their body toward the trainer’s hands or walked toward the trainer within 5 s of the presentation of the come cue. While the participant approached the trainer, the trainer showed the open-hands gesture and said encouraging words, such as “good boy” or “way to go.” When the participant was within proximity, the trainer petted or scratched with both hands on any part of the



participant's body that was within proximity for 30-40 s. The trainer required two consecutive successful trials to move on to the next step for most of these shaping steps. The two consecutive trials included the trainer walking once to the right and once to the left. For Shaping Steps 3 and 6, three consecutive successful trials were required.

A trial was unsuccessful if the participant kept all four hooves on the ground in the same spot for more than 5 s after the presentation of the come cue or walked away from the trainer. When this happened, the trainer waited for an additional 5 s. If the participant moved its body toward the trainer's hands or walked toward the trainer within 10 s of the presentation of the come cue, the trainer showed the open-hands gesture and said encouraging words, such as "good boy" or "way to go." When the participant approached within proximity, the trainer petted or scratched with both hands for 30-40 s. If the participant did not start walking to the trainer within 10 s of the come cue, the trainer re-presented the come cue and waited until the participant approached the trainer. If there were three consecutive unsuccessful trials, the trainer returned to the previously successful step on the next trial. If the participant approached the trainer before the come cue, the trainer started a new trial. This did not count as a successful or unsuccessful trial.

Every session started with two or three trials of the previously successful shaping step. The appendix describes all six shaping steps. The come cue differed depending on the shaping step. For Shaping Steps 1 to 4, the trainer used the presentation of both hands as a come cue. At Shaping Step 5, the trainer added a new come cue, which was a combination of the word "come" and a hand wave. The trainer first presented the new come cue followed by the old come cue, which was the presentation of both hands. At Step 6, the trainer only presented the come cue of saying "come" and waving one hand. During these shaping steps, the distance between the

trainer and the participant gradually increased. Shaping Steps 1 and 2 required the participant to turn its head toward the trainer's hands. Shaping Steps 3 to 6 required the participant to walk from 1 to 4 steps toward the trainer.

The mastery criterion for this phase of the training was three consecutive successful trials of Shaping Step 6.

### Train Stay and Come Combined

In this condition, the trainer sequentially combined the stay and come cues from the previous conditions. The participant learned to stay while the trainer took 5 steps and paused for 10s. Then, the participant walked to the trainer within 5 s of the presentation of the come cue.

A trial began when the trainer presented the stay cue and took 5 steps away from the participant. While standing 5 steps away, the trainer slowly rotated her body 180 degree and faced the participant. After a certain amount of duration, the trainer presented the come cue and waited for an additional 5 s. A successful trial was when the trainer presented a stay cue, the participant kept at least three hooves on the ground in the same spot until the presentation of the come cue, and when the trainer presented a come cue, the participant moved one leg toward the trainer within 5 s after the come cue and then approached within proximity. This was reinforced with petting and scratching (40-60 s) as in the previous conditions. After two consecutive successful trials, the trainer moved to the next shaping step.

There were two kinds of unsuccessful trials: unsuccessful stay and unsuccessful come. Unsuccessful stay was when the trainer provided a stay cue, the participant moved more than one hoof simultaneously, or walked away from or toward the trainer before the come cue. When this happened, the trainer waited until the participant stopped and stood straight, and then started a new trial and repeated the same shaping step. Unsuccessful come was when the participant kept

all four hooves on the ground for more than 5 s after a come cue, or walked away from the trainer. When this happened, the trainer waited for an additional 5 s. If the participant moved their body toward the trainer's hands or walked toward the trainer within 10 s of the presentation of the come cue, the trainer petted or scratched the participant when the participant was within proximity. If the participant stayed more than 10 s after the come cue, the trainer re-presented the come cue and waited until the participant approached the trainer. If there were three consecutive unsuccessful trials of either kind, the trainer returned to the previously successful shaping step on the next trial. If there were four consecutive unsuccessful trials of the same kind, the trainer went back to the prior condition and re-trained stay or come.

Every session started with 2 or 3 trials of the previously successful shaping step. The appendix describes the 5 shaping steps. In all the shaping steps, the trainer took 5 steps away from the participant. The difference between the steps was the duration that the trainer waited at 5 steps away until the presentation of the come cue. For all the shaping steps, except the final Shaping Step 5 (5 steps and 10 s), two consecutive successful trials were required to move to the next step. The mastery criterion for training stay and come combined was three consecutive successful trials of the final Shaping Step 5 (5 steps and 10 s).

In some cases, the trainer conducted probe sessions to help further determine whether the participant's behavior was on cue. Each probe session consisted of one trial. The trainer conducted probe sessions if on one of the last three trials of the final Shaping Step 5 (5 steps and 10 s), the participant moved toward the trainer right before the trainer gave the come cue or as the trainer was beginning to give the come cue.

#### Post-Assessment

The procedure for the post-assessment was identical to the pre-assessment.

## Design

A changing criterion design was used for training stay, come, and stay and come combined. To demonstrate experimental control, the trainer required three consecutive trials at certain shaping steps (see the appendix). The pre-assessment was conducted before the reinforcement system training, and the post-assessment was conducted after training stay and come combined.

## RESULTS

Figure 1 displays latency to approach data during the pre-assessment, reinforcement system training, and the post-assessment for the three participants. The top graph displays Claudius's latency, the middle graph displays Sancho's latency, and the bottom graph displays Castor's latency. The x-axis for each graph is the number of trials, and the y-axis is the latency to approach, which was measured in seconds. The latency could not be recorded four times for Claudius and once for Sancho due to technical issues or because the participant was off camera. This is represented on the graph by a star. If the participant engaged in push, nibble, or bite, the trainer took a step back and then started a new trial. Because the participant did not approach on these trials, latency was not collected. These trials are represented by a black circle. The cross mark represents that the participant walked away the area without approaching or interaction with the trainer.

In general, Claudius took less time to approach during the reinforcement system training (range 2-11 s). The amount of time to approach was similar during the pre-assessment (range 3-45 s) and post-assessment (range 8-94 s). There was one trial in the post-assessment where Claudius took 94 s to approach, but the rest of his post-assessment trials had a latency of 38 s or less. Sancho took slightly less time to approach during the post-assessment (range 4-26 s) than during the pre-assessment (range 0-45 s) or the reinforcement system training (range 5-129 s). With the exception of the first trial, all of Sancho's latencies during the reinforcement system training were less than 39 s. Castor took slightly more time to approach during the post-assessment (range 3-31 s) than during the pre-assessment (range 2-11 s) or during the reinforcement system training (range 3-7 s).

Figure 2 displays the cumulative duration of interaction, nuzzle, and cuddle during the

pre-assessment, reinforcement system training, and the post-assessment. The top graph shows Claudius's data, the middle graph displays Sancho, and the bottom graph shows Castor. The x-axis is the number of trials, and the y-axis is the cumulative duration in seconds. A black circle represents interaction, a black square represents nuzzle, and a black triangle represents cuddle. The lines for each behavior are reset to zero for each new condition. Technical issues are represented by a flat line with a star above. A cross mark designates trials where there was no interaction because the participant walked away without approaching or interacting with the trainer.

Claudius' cumulative duration for interaction was 854 s in the pre-assessment, 210 s in the reinforcement system training, and 1304 s in the post-assessment. The cumulative duration for nuzzle was none for all conditions. The cumulative duration for cuddle was 4 s in the pre-assessment, 4 s in reinforcement system training, and 2 s in the post-assessment.

Sancho's cumulative duration for interaction was 1138 s in the pre-assessment, 682s in reinforcement system training, and 1306 s in the post-assessment. The cumulative duration for nuzzle was 60 s in the pre-assessment, 2 s in reinforcement system training, and 52 s in the post-assessment. The cumulative duration for cuddle was 2 s in the pre-assessment, 2 s in reinforcement system training, and 133 s in the post-assessment.

Castor's cumulative duration for interaction was 1309 s in the pre-assessment, 230 s in reinforcement system training, and 1197 s in the post-assessment. The cumulative duration for nuzzle was 19 s in the pre-assessment, 2 s in reinforcement system training, and 15 s in the post-assessment. The cumulative duration for cuddle was 306 s in the pre-assessment, 4 s in reinforcement system training, and 36 s in the post-assessment.

Figure 3 displays the cumulative number of nuzzle, cuddle, offer, leave, walk away, push,

nibble, and bite during the pre-assessment, reinforcement system training, and the post-assessment. The x-axis is the number of trials, and the y-axis is the cumulative number. A black square represents nuzzle, a black triangle represents cuddle, a black circle represents offer, a white circle represents leave, a white diamond represents walk away, a white triangle represents push, a white square represents nibble, and a cross represents bite. The lines for each behavior reset to zero for each new condition. Technical issues are represented by a star symbol.

Claudius displayed 27 instances of offer during the post-assessment. There was one instance of leave in the pre-assessment, and three or fewer instances of any other behaviors in all three conditions. Sancho displayed 21 instances of nuzzle during the pre-assessment, six instances of offer, four instances of nibble, and one instance of cuddle and bite. During the reinforcement system training, there were nine nibbles, almost all of which occurred during the first half of the trials. There were three instances of offer, two instances of leave and cuddle, and one instance of nuzzle and walk away. During the post-assessment, Sancho had 24 offer, 12 cuddle, seven nuzzle, and none of the other behaviors occurred. During the pre-assessment, Castor had 25 instances of cuddle, eight instances of both nuzzle and push, seven instances of offer, and two instances of nibble. During the reinforcement system training, there were one instance of cuddle and nuzzle. During the post-assessment, there were four instances of nuzzle and three instances of cuddle, two instances of offer, and one instance of leave and push.

Claudius and Castor mastered the reinforcement system training in three trials, and Sancho mastered the reinforcement system training in 20 trials.

Figure 4 displays Claudius's training data. The top graph shows Claudius' training data during the baseline of stay and first phase of training the stay. The middle graph shows Claudius' training data during the second phase of training the stay. The bottom graph shows Claudius'

training data during the baseline of come, training the come, and training the stay and come combined. In all three graphs, the x-axis displays the trial number and session number, and the y-axis displays the shaping steps. A black circle represents a successful trial. A white open circle represents an unsuccessful stay trial. A white open triangle represents an unsuccessful come trial.

In the baseline for stay, all 10 trials were unsuccessful. In the first phase of training a stay, Claudius met the mastery criteria in two sessions and in 9 min and 50 s. This consisted of 23 trials, two of which were unsuccessful. In the second phase of training a stay, Claudius met the mastery criteria in six sessions and in 24 min and 14 s. This consisted of 39 trials, three of which were unsuccessful. The three unsuccessful trials all occurred when the trainer was taking one step away and waiting 6 s. In the baseline for come, all 10 trials were unsuccessful. While training come, Claudius met the mastery criteria in five sessions and in 19 min and 11 s. This consisted of 27 trials, five of which were unsuccessful. While training stay and come combined, Claudius met the mastery criteria in seven sessions and in 48 min and 36 s. This consisted of 43 trials total, including 10 unsuccessful stay trials and 10 unsuccessful come trials.

Figure 5 displays Sancho's training data. The format is identical to Claudius's training data. The cross mark represents trials when the participant left the trainer. In the baseline for stay, there were nine unsuccessful trials and one successful trial. In the first phase of training a stay, Sancho met the mastery criterion in seven sessions and in 30 min and 17 s. This consisted of 80 trials, 11 of which were unsuccessful. During this phase of the training, the criteria was lowered eight times. In the second phase of training a stay, Sancho met the mastery criteria in seven sessions and in 30 min and 5 s. This consisted of 45 trials, including two unsuccessful trials and one instance of leave. In the baseline of come, 8 out of 10 trials were unsuccessful. The two successful trials were at the beginning of each session. While training come, Sancho met the



mastery criteria in two sessions and in 18 min and 19 s. This consisted of 23 trials, including five unsuccessful trials. In the training of stay and come combined, Sancho met the mastery criteria in six sessions and in 40 min and 23 s. This consisted of 39 trials, including 11 unsuccessful stay trials, five unsuccessful come trials, and one instance of leave. Many of the unsuccessful trials occurred during the last two shaping steps.

Figure 6 displays Castor's training data. The format is identical to Claudius's training data. In the baseline for stay, all 10 trials were unsuccessful. In the first phase of training a stay, Castor met the mastery criteria in two sessions and in 14 min and 30 s. This consisted of 27 trials, including two unsuccessful trials. Both unsuccessful trials occurred on shaping step #7 (5 s). In the second phase of training a stay, Castor met the mastery criteria in six sessions and in 38 min and 11 s. This consisted of 51 trials, 12 of which were unsuccessful. Most of the unsuccessful trials occurred while the trainer was building duration at one step away. In the baseline for come, 7 out of 10 trials were unsuccessful, while three trials were successful. While training come, Castor met the mastery criteria in two sessions and in 13 min and 50 s. This consisted of 22 trials, 3 of which were unsuccessful. While training stay and come combined, Castor met the mastery criteria in two sessions and in 19 min and 10 s. This consisted of 18 trials, including 2 unsuccessful stay trials and 4 unsuccessful come trials.

Figure 7 displays the total training time for all three participants. The total training time was 106 min for Claudius, 132 min for Sancho, and 89 min for Castor.

## DISCUSSION

This study showed that social interaction, in the form of petting and gentle scratching, could be used as a reinforcer for three equines. This was demonstrated first during the reinforcement system training and then further while training stay and come. During the reinforcement system training, the trainer petted and scratched the equine as long as the equine stayed within proximity and did not engage in push, nibble, or bite. When comparing the pre-assessment data with the post-assessment data, longer durations and more frequency of nuzzle, cuddle, and offer were observed in two participants. During the post-assessment, the frequency of walk away, nibble, and bite dropped to zero for all three participants, and only one instance of push and one instance of leave occurred in one participant. During the second part of the study, all three equines met the final criteria for learning stay and come on cue. In addition, all training sessions were conducted in the natural environment and the equine chose to initiate each training session by approaching the trainer. This further demonstrates that petting and scratching functioned as a reinforcer for the equines in this study.

When comparing the quality of interaction between the pre- and post-assessment, there were notable positive changes in two of the participants, Claudius and Sancho. Claudius became more interactive with the trainer. During the pre-assessment, although Claudius offered and cuddled more than once, it mostly stood still with little body movement. During the post-assessment, it offered its body parts many times. Claudius especially preferred the hip to be petted or scratched. Thus, when the trainer petted or scratched different parts of Claudius' body, it moved and offered the hip area. Anecdotally, Claudius also engaged in other behaviors during the post-assessment to communicate an enjoyment of being scratched, such as moving its lip. Sancho nuzzled many times, nibbled, and offered a few times during the pre-assessment, but the

duration of these behaviors was short. During the post-assessment, Sancho offered, cuddled, and nuzzled many times and for longer durations.

In contrast to Claudius and Sancho, Castor cuddled and nuzzled many times and for longer durations during the pre-assessment than the post-assessment. In one trial during the post-assessment, Castor left and stayed away for 50 s. Before Castor left the trainer, the cameraman moved his body and Castor moved toward the cameraman, then turned its body to the trainer, scratched its leg with its mouth, and then re-approached the trainer within proximity.

The latency to approach varied across the participants and was sometimes longer during the post-assessment. Several factors likely contributed to these results. The training sessions were conducted in the natural environment, and the other members of the herd may have influenced the equine's behavior, especially when these other members of the herd were close by. Another variable that may have influenced the latency to approach during the post-assessment was the stay behavior that was learned in the previous conditions. Almost all of the trials in the post-assessment for all participants took more than 10 s for the equine to approach. This was the amount of time that the equine had to stay during the stay and come combined condition. Even though the trainer did not present the stay cue, the context was similar.

The procedure not only established stay and come in three participants, there were several collateral outcomes that were not directly measured. After some experience with the procedure, the participants started to follow and stay near the trainer when the trainer attempted to leave. Also, when the trainer re-entered the pasture after conducting sessions with the other participants in the other pasture, the participant would approach the trainer again. The second collateral outcome was that some of the other equines in the herd started approaching and seeking interaction. The other members of the herd could interact with the trainer and the cameraman

during the breaks between the training sessions, and the cameraman sometimes interacted with these equines during the training to prevent them from interrupting the training. One mule, in particular, Sebastian would walk away quickly if the trainer approached him directly. By the end of the study, Sebastian directly approached the trainer or cameraman to seek social interaction.

The results of the current study differed from Sankey et al. (2010) and Feuerbacher and Wynne (2012). These two studies questioned the effectiveness of petting and scratching as a reinforcer. However, there were critical differences between these two studies and the current study. In these two previous studies, the horses received three repetitions of scratching on their withers (Sankey et al. 2010) and the dogs received scratches around their neck for 4 s with verbal praise (Feuerbacher & Wynne, 2012). In both studies, the location and intensity of the scratching was pre-determined by the experimenter and did not change throughout the study. In contrast, during the current study, the trainer scratched with one or two hands and allowed the participant to decide where to be petted or scratched. In addition, the current study was conducted in the natural environment and each session was initiated by the participant. This was not the case in the studies conducted by Sankey et al. (2010) and Feuerbacher and Wynne (2012). All of these factors might have contributed to the effectiveness of petting and gentle scratching as a reinforcer in the current study.

Future research should explore how and when to add the stay and come cues. During this study, there were many unsuccessful trials in the stay and come combined condition. One possible reason could be that the previous training conditions did not establish a discrimination between the stay and come cues. This resulted in confusion between stay and come in the last condition. One solution may be to practice both cues together earlier in the procedure.

In conclusion, the current study demonstrated that social interaction, in the form of

petting and gentle scratching, could functioned as an effective reinforcer when training equines to come and stay in their natural environment.

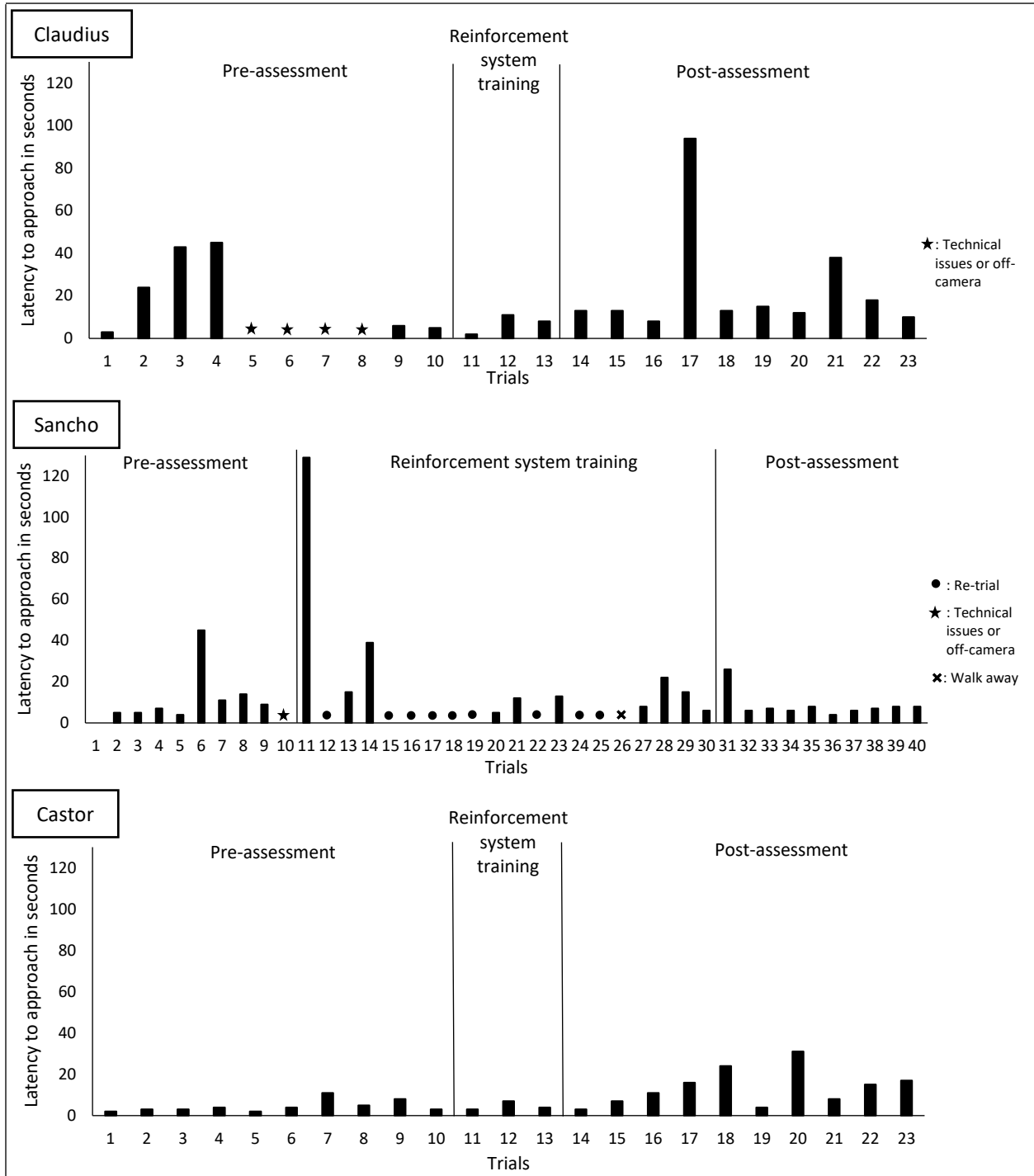


Figure 1. This figure shows the latency to approach for pre-assessment, reinforcement system training, and post assessment. The top graph shows Claudius's data, the middle graph shows Sancho, and the bottom graph shows Castor.

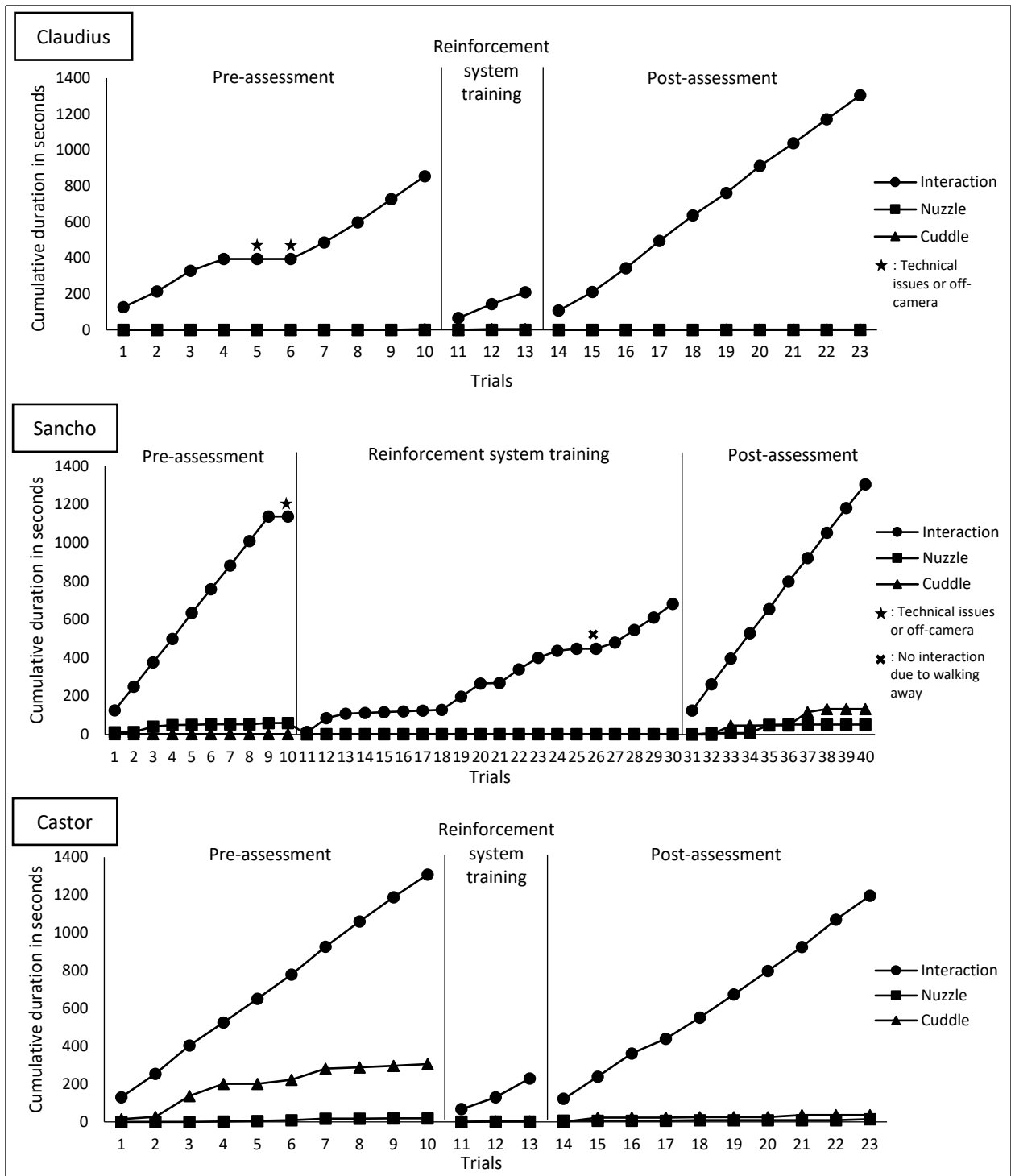


Figure 2. This figure shows the cumulative duration of interaction, nuzzle, and cuddle for pre-assessment, reinforcement system training, and post assessment. The top graph shows Claudius's data, the middle graph shows Sancho, and the bottom graph shows Castor.

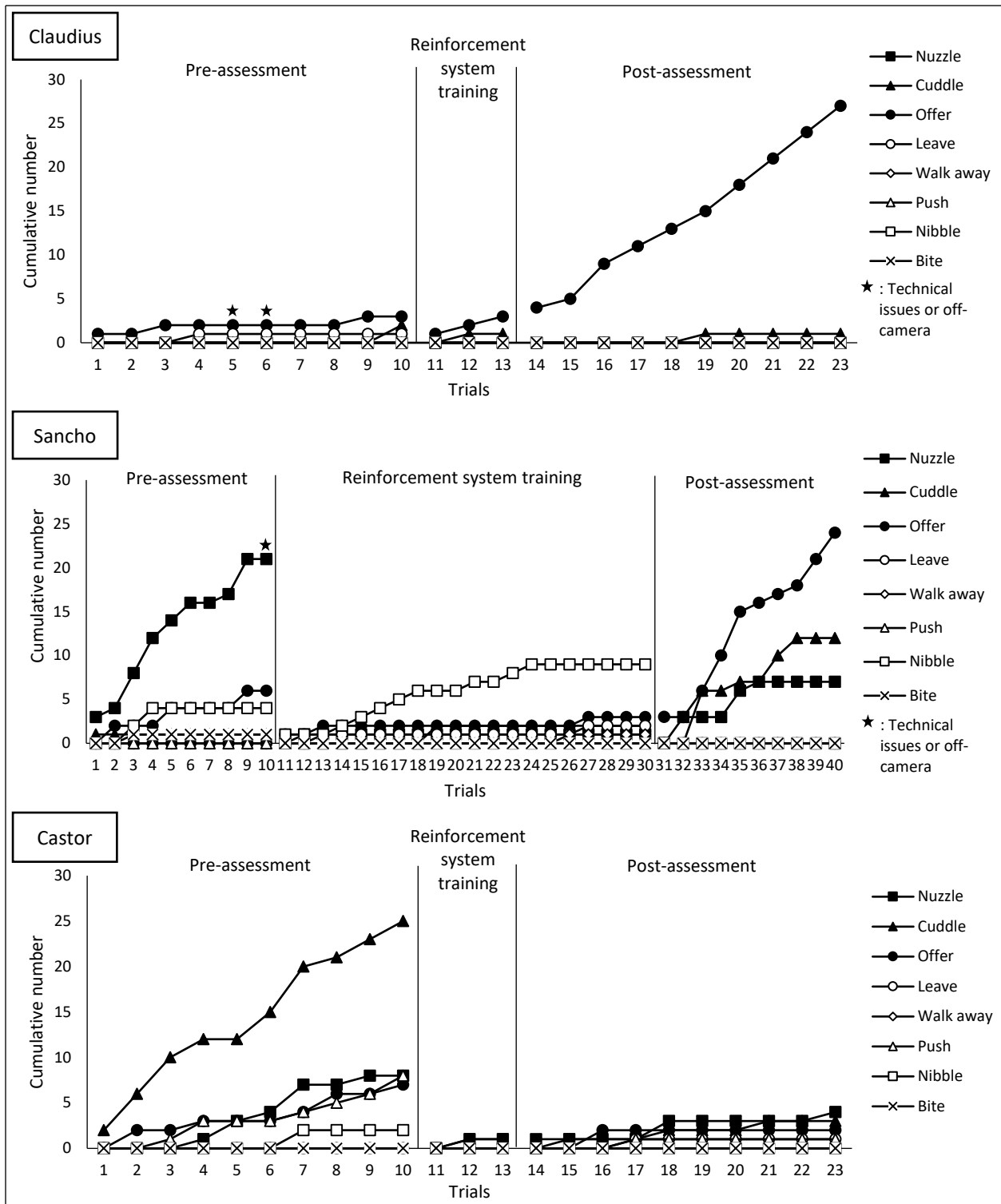


Figure 3. This figure shows the cumulative number of nuzzle, cuddle, offer, walk away, push, nibble, and bite for pre-assessment, reinforcement system training, and post assessment. The top graph shows Claudius’s data, the middle graph shows Sancho, and the bottom graph shows Castor.

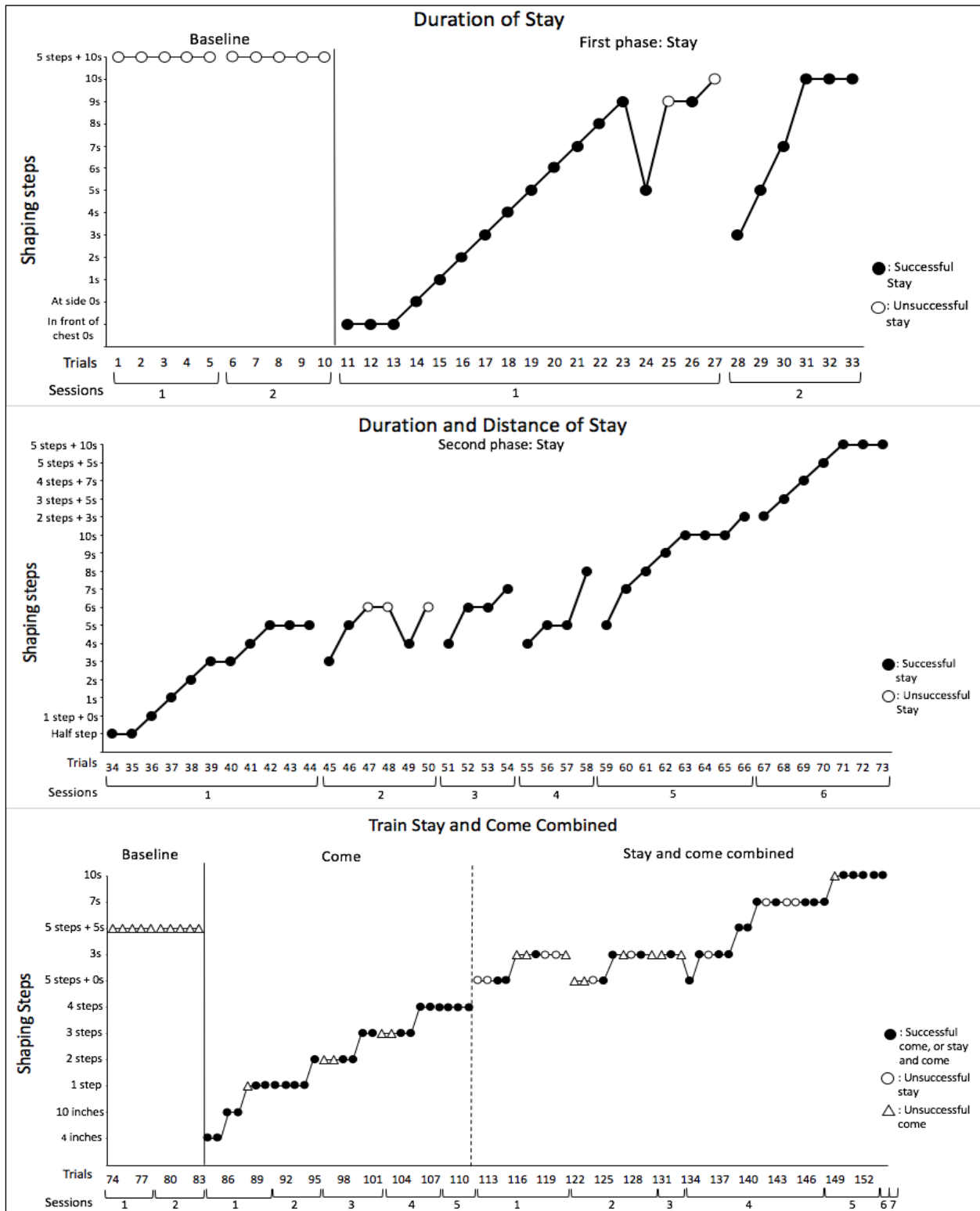


Figure 4. The top graph shows Claudius' training data during the baseline of stay and first phase of training the stay, the middle graph shows Claudius' training data during the second phase of training the stay, the bottom graph shows Claudius' training data during the baseline of come, training the come, and training the stay and come combined.



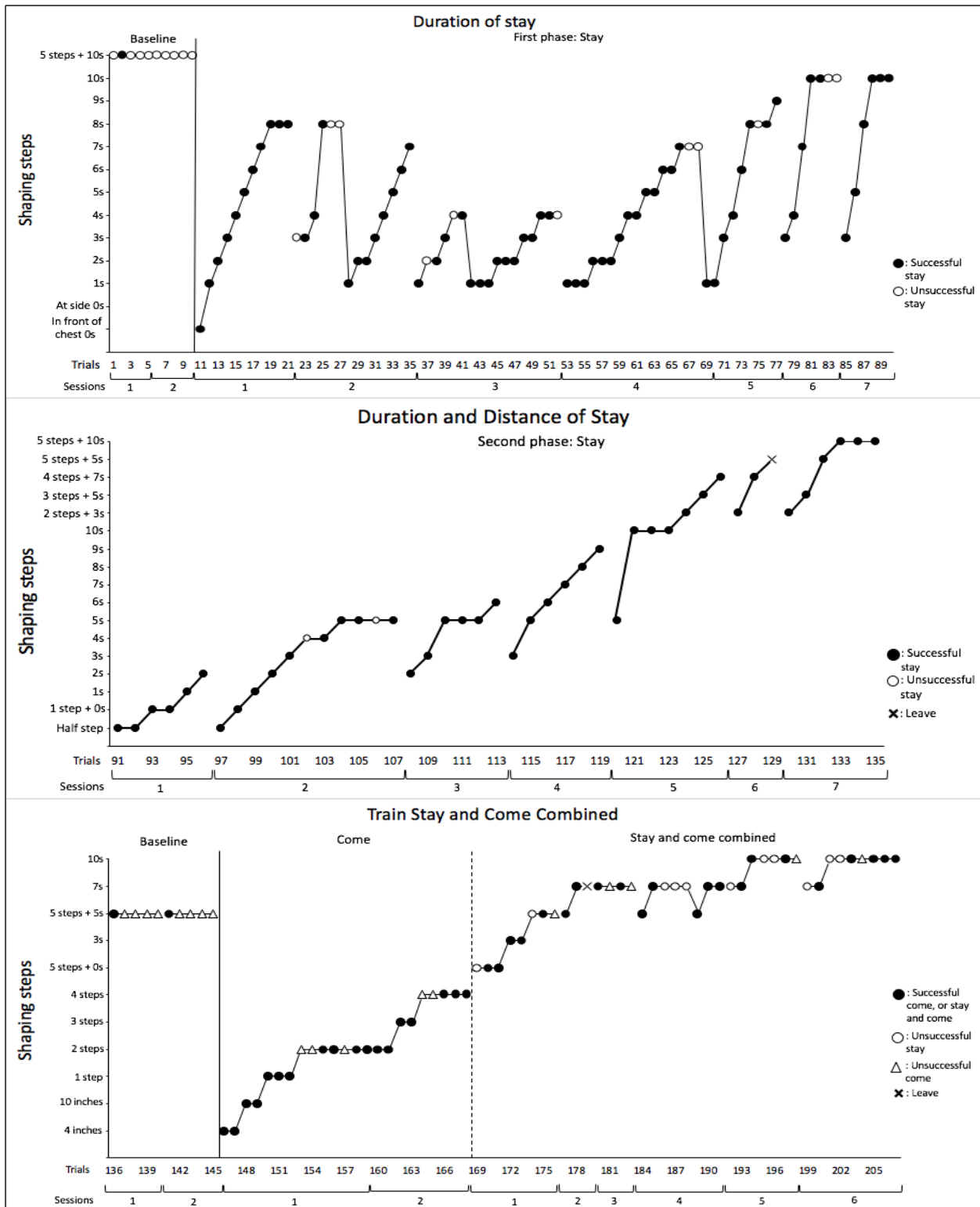


Figure 5. The top graph shows Sancho's training data during the baseline of stay and first phase of training the stay. The middle graph shows Sancho's training data during the second phase of training the stay. The bottom graph shows Sancho's training data during the baseline of come, training the come, and training the stay and come combined.

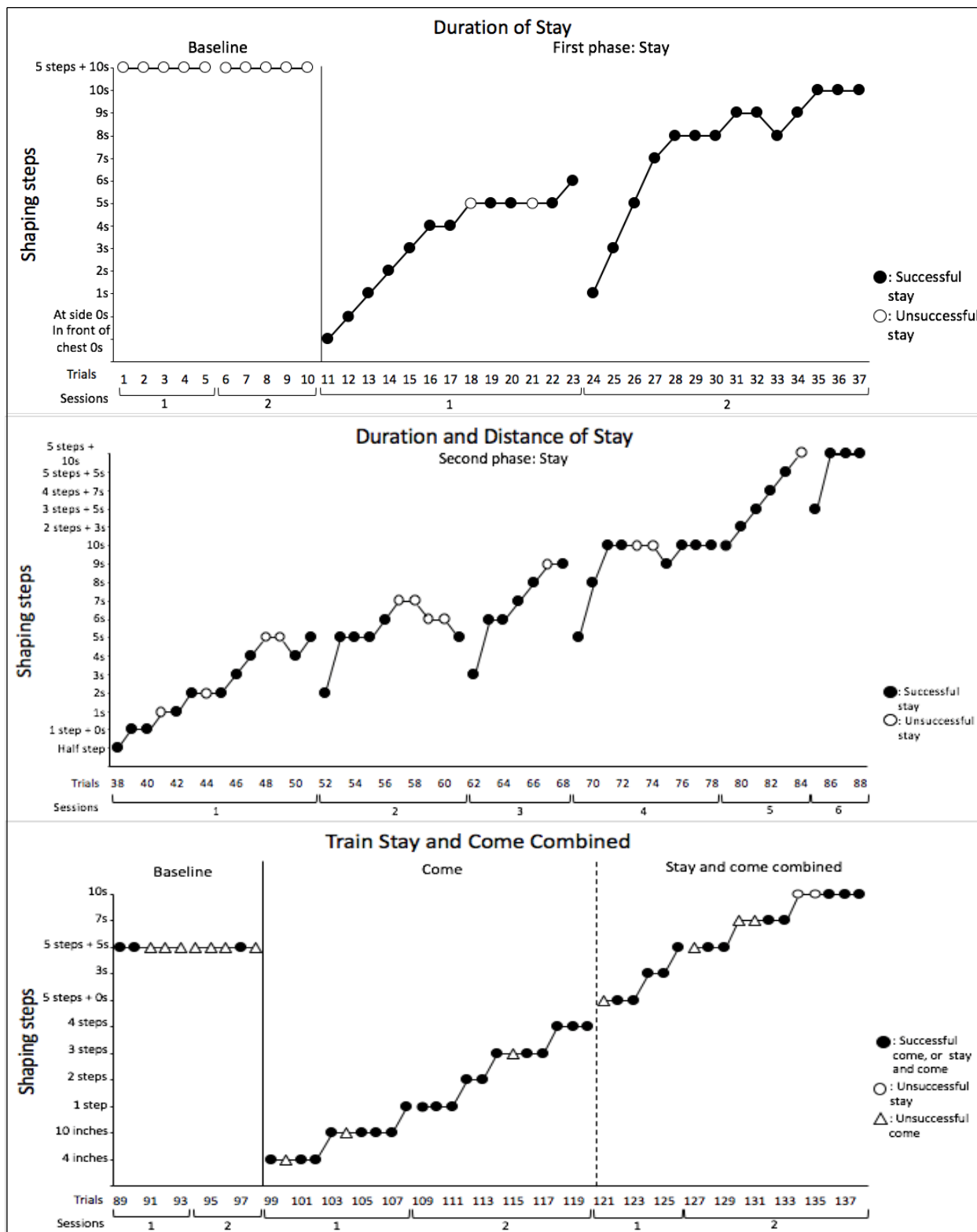
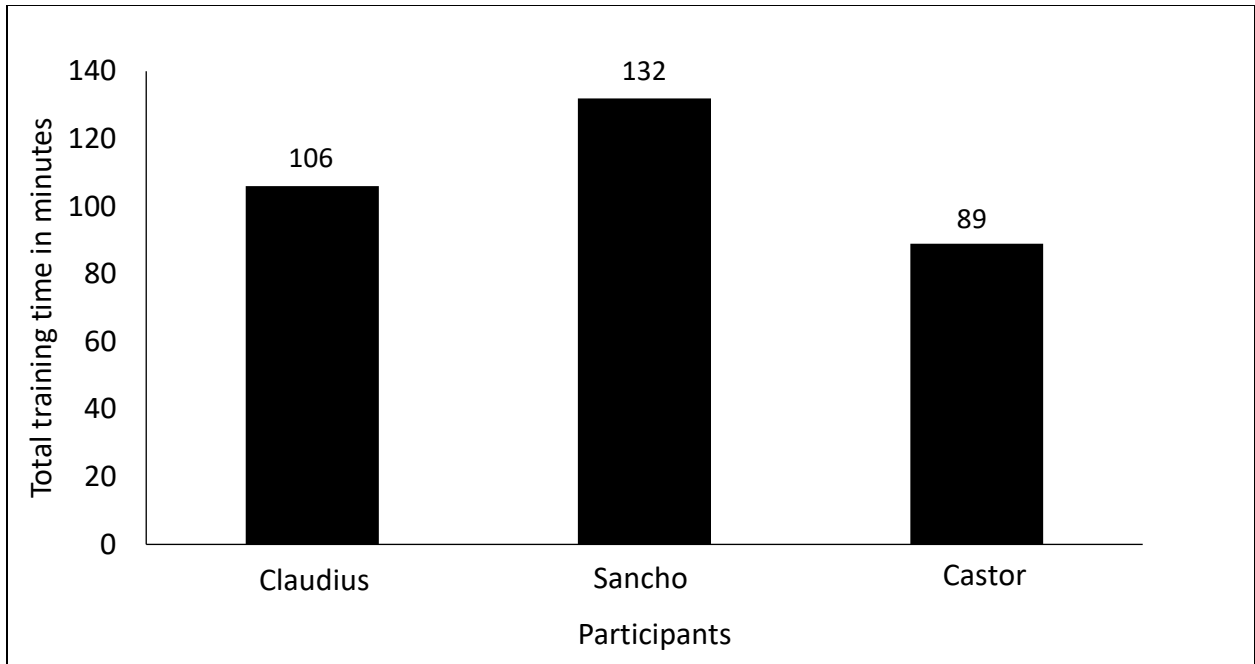


Figure 6. The top graph shows Castor’s training data during the baseline of stay and first phase of training the stay. The middle graph shows Castor’s training data during the second phase of training the stay. The bottom graph shows Castor’s training data during the baseline of come, training the come, and training the stay and come combined.



*Figure 7.* Total training time across three participants, Claudius, Sancho, and Castor.

APPENDIX

SHAPING STEPS FOR TRAINING STAY, COME, AND STAY AND COME COMBINED

First phase: Stay

Step	Trainer's behavior	Criteria
1	Move both hands in front of chest	1 trial
2	Move both hands at side for 0 s	1 trial
3	Move both hands at side for 1 s	1 trial
4	Move both hands at side for 2 s	1 trial
5	Move both hands at side for 3 s	1 trial
6	Move both hands at side for 4 s	1 trial
7	Move both hands at side for 5 s	1 trial
8	Move both hands at side for 6 s	1 trial
9	Move both hands at side for 7 s	1 trial
10	Move both hands at side for 8 s	1 trial
11	Move both hands at side for 9 s	1 trial
12	Move both hands at side for 10 s	3 trials

Second phase: Stay

Step	Trainer's behavior	Criteria
1	Took one step while facing the participant	1 trial
2	At one step away, paused for 1 s	1 trial
3	At one step away, paused for 2 s	1 trial
4	At one step away, paused for 3 s	1 trial
5	At one step away, paused for 4 s	1 trial
6	At one step away, paused for 5 s	3 trials
7	At one step away, paused for 6 s	1 trial
8	At one step away, paused for 7 s. During 7 s, turned the upper body 90 degree to the right and left.	1 trial
9	At one step away, paused for 8 s. During 8 s, turned the body 90 degree to the right and left	1 trial
10	At one step away, paused for 9 s. During 9 s, slowly rotated body 180 degree to the right or left	1 trial
11	At one step away, paused for 10 s. During 10 s, slowly rotated body 360 degree	3 trials
12	Took two steps while facing back to the participant and paused for 3 s	1 trial
13	Took three steps while facing back to the participant and paused for 5 s	1 trial
14	Took four steps while facing the back to the participant and paused for 7 s. During 7 s, rotated body 360 degree	1 trial
15	Took 5 steps while facing back to the participant and paused for 5 s. During 5 s, slowly rotated the body 360 degree	1 trial
16	Took 5 steps while facing back to the participant and paused for 10 s. During 10 s, slowly rotated the body 360 degree *Petted/scratched for 1 min	3 trials

Come

Step	Trainer's behavior	Criteria
1	Presented both hands 4 inches away from the participant's mouth	2 consecutive trials (Right and left)
2	Presented both hands 10 inches away from the participant's mouth	2 consecutive trials (Right and left)
3	At one step away, presented both hands	3 consecutive trials
4	At two steps away, presented both hands	2 consecutive trials
5	At three steps away, said "come" and waved a hand, and then presented both hands	2 consecutive trials
6	At four steps away, said "come" and waved a hand, and waited for the participant to walk.	3 consecutive trials

Stay and come combined

Step	Trainer's behavior	Criteria
1	Presented stay cue and took 5 steps away from the participant. Then, presented come cue	2 consecutive trials
2	Presented stay cue and took 5 steps away from the participant and paused for 3 s. Then, presented come cue	2 consecutive trials
3	Presented stay cue and took 5 steps away from the participant and paused for 5 s. Then, presented come cue	2 consecutive trials
4	Presented stay cue and took 5 steps away from the participant and paused for 7 s. Then, presented come cue	2 consecutive trials
5	Presented stay cue and took 5 steps away from the participant and paused for 10 s. Then, presented come cue	3 consecutive trials

## REFERENCES

- AVMA Animal Welfare Forum: Equine Welfare. (2000). *Journal of the American Veterinary Medical association*, 216(8), 1231-1262.
- Azrin, N. H. & Holz, W. C. (1966). Punishment. In W. K. Honing (Ed.), *Operant behavior: Areas of research and publication* (pp. 380-447). New York: Apple-Century-Crofts.
- Birke, L. (2007). "Learning to speak horse": The culture of "Natural Horsemanship." *Society and Animals*, 15(3), 217-239.
- Boissy, A., Manteuffel, G., Jensen, M. B., Moe, R. O., Spruijt, B., Keeling, L. J.,... Aubert, A. (2007). Assessment of positive emotions in animals to improve their welfare. *Journal of Physiology and Behavior*, 92(3), 375-397.
- Breland, K., & Breland, M. (1951). A field of applied animal psychology. *American Psychologist*, 6(6), 202-204.
- Breland, K., Breland, M., & Bailey, R. E. (2018). *Animal Behavior*. Houston, TX: Storymaker, Inc.
- Dorey, N. R., Rosales-Ruiz, J., Smith, R., & Lovelance, B. (2009). Functional analysis and treatment of self-injury in a captive olive baboon. *Journal of Applied Behavior Analysis*, 42(4), 785-794.
- Dorrance, T. (1994). *True unity: Willing communication between horse and human*. Sanger, CA: World Dancer Press.
- Falk, J. L. (1958). The grooming behavior of the chimpanzee as a reinforcer. *Journal of Experimental Analysis of Behavior*, 1(1), 83-85.
- Feuerbacher, E. N. & Wynne, C. D. L. (2012). Relative efficacy of human social interaction and food as reinforcers for domestic dogs and hand-reared wolves. *Journal of the Experimental Analysis of Behavior*, 98(1), 105-129.
- Ferster, C. B. (1972). Clinical reinforcement. *Seminars in Psychiatry*, 4(2). 101-111.
- Hendriksen, P., Elmgreen, K., & Ladewig, J. (2011). Trailer-loading of horses: Is there a difference between positive and negative reinforcement concerning effectiveness and stress-related signs? *Journal of Veterinary Behavior*, 6, 261-266.
- Innes, L., & McBride, S. (2008). Negative versus positive reinforcement: An evaluation of training strategies for rehabilitated horses. *Journal of Applied Animal Behaviour Science*, 112, 357-368.
- Karrasch, S., Karrasch, V., & Newman, A. (2000). *You can train your horse to do anything! On target training: Clicker training and beyond*. North Pomfret, VT: Kenilworth Press Ltd.

- Kurland, A. (2003). *The click that teaches: A step-by-step guide in picture*. Delmar, NY: The Clicker Center.
- Laule, G. E., Bloomsmith, M. A., & Schapiro S. J. (2003). The use of positive reinforcement training techniques to enhance the care, management, and welfare of primates in the laboratory. *Journal of Applied Animal Welfare Science*, 6(3), 163-173.
- Miller, R. M. (2007). *Natural Horsemanship explained: From heart to hands*. Guilford, CT: Rowman & Littlefield.
- Owens, C. J. (2017). A constructional approach to establishing and maintaining calm canine behavior. (unpublished master's thesis). University of North Texas, Denton, Texas.
- Owens, C. J., Katz, M., Will, S., Belcher, L., Cox, T., & Rosales-Ruiz, J. (2013). *Touch as an effective reinforcer for dogs in shelters*. Poster presented at the 39<sup>th</sup> Annual Association of Behavior Analysis International, Minneapolis, MN.
- Parelli, P. (with Kadash, K). (1993). *Natural horse-man-ship*. Colorado Springs, Colorado: Western horseman Inc.
- Pryor, K. (1999). *Don't shoot the dog: The new art of teaching and training*. Waltham, MA: Sunshine Books.
- Ramirez, K. (1999). *Animal training: Successful animal management through positive reinforcement*. Chicago, Illinois: Shedd Aquarium Society.
- Roberts, M. (1998). *The man who listens to horses*. New York, NY: Ballantine Books.
- Rolling, B. E. (2000). Equine welfare and emerging social ethics. *Journal of the American Veterinary Medical Association*. 216(8). 1234-1237.
- Sankey, C., Henry, S., Górecka-Bruzda, A., Richard-Yris, M. A., & Hausberger, M. (2010). The way to a man's heart is through his stomach: What about horses? *PLoS one*, 5(11), 1-4.
- Skinner, B. F. (1953). *Science and human behavior*. New York, NY: Macmillan.
- Stokes, T. F. & Baer, D. M. (1977). An implicit technology of generalization. *Jornal of Applied Behavior Analysis*, 10(2), 349-367.