A SHAPING PROCEDURE FOR INTRODUCING HORSES TO CLIPPING

Alison Hardaway

Thesis Prepared for the Degree of

MASTER OF SCIENCE

UNIVERSITY OF NORTH TEXAS

December 2019

APPROVED:

Jesús Rosales-Ruiz, Major Professor
April Becker, Committee Member
Samantha Bergmann, Committee Member
Manish Vaidya, Chair of the Department of Behavior Analysis
Neale R. Chumbler, Dean of the College of Health and Public Service
Victor Prybutok, Dean of the Toulouse Graduate School

Hardaway, Alison. *A Shaping Procedure for Introducing Horses to Clipping*. Master of Science (Behavior Analysis), December 2019, 25 pp., 1 table, 2 figures, references, 19 titles.

The purpose of the current study is to evaluate a procedure that can be used to introduce horses to clipping. Negative reinforcement was used in a shaping paradigm. Shaping steps were conducted by the handler, starting with touching the horse with the hand, then touching the horse with the clippers while they are off, culminating with touching the horse with the clippers while they are on. When a horse broke contact with either the hand or the clippers, the hand or the clippers were held at that point until the horse emitted an appropriate response. When the horse emitted an appropriate response, the clippers were removed, and the handler stepped away from the horse. For all eight horses, this shaping plan was effective in enabling the clipping of each horse with minimal inappropriate behavior and without additional restraint. The entire process took under an hour for each horse.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

Page

Tsbles

Figures

CHAPTER 1

INTRODUCTION

Clipping is a hair removal process important to the health of horses. The clipping procedure is typically done to enable necessary veterinary procedures and also in the winter, when the horses' coats are thick, to prevent fungus and help better regulate body temperature in working horses (Gough, 1997). Horses generally find this procedure aversive. That is, they display behaviors in order to try to escape the situation (Gough, 1999). Ali, Gutwein, and Heleski (2017) hypothesized that horses naïve to clippers would find ear clipping aversive. They reported changes in heart rate and behavior during baseline. Yarnell, Hall, and Billett (2013) found that upon seeing the clippers, 10 out of 10 horses had increased body temperature and heart rate, and their behavior also changed. Although the clippers produce no physical discomfort to the horse, horses will often display non-compliant behavior, such as "high degree of activity, very restless, raising of the head, whole body movement including feet" (Yarnell et al., p.34). These behaviors make it hard for a handler to continue clipping hair effectively; the handler has no choice but to remove the clippers and try something else. Unfortunately, removing the clippers after problem behavior may negatively reinforce it, and thus the horse may be more likely to engage in that behavior in the future. If the horse finds the procedure aversive, the behaviors that the horse engages in can become dangerous – such as rearing or running the handler over – especially if the handler continues to apply the clippers.

Researchers have tested several techniques to reduce unwanted behavior during clipping. For example, Ali et al. (2017) evaluated the use of upper lip twitching to prevent non-compliant behavior. Upper lip twitching is a controversial procedure in which a rope loop on the end of a wooden stick, called a twitch, is placed around the upper lip muscle of the horse and twisted until the horse relaxes. Ali et al. (2017) found this restraint method to decrease the time it took to clip horses' ears and to reduce stress induced by clipping. They measured heart rate as well as behavioral reactivity and found that clipping without a twitch was correlated with more reactivity and higher heart rates than clipping with a twitch. They twitched each horse two hours later and found that heart rate increased less then when twitched the first time. By doing so, they concluded that the use of the twitch once did not increase aversion to the twitch a second time and could be useful for short durations of time. It is important to note that the horses may have still found the twitch aversive, even if a decrease in heart rate was measured. They did note that the twitch is not a substitute for training.

The procedure used in Ali et al. (2017) might be effective for a small clip – such as the inside of the ear – but was not evaluated for clips lasting longer than 2 minutes. An entire body clipping can take two hours. In the study, they did not recommend a twitch for a long period of time. Regardless, in some situations, twitches are ineffective in making a horse still enough for clipping. Handlers will then use sedative drugs to manage the horse for the safety of both the horse and handler during the procedure (Gough, 1997). Side effects of sedation include momentary changes in heart rate and respiratory rate (Sanchez, Elfenbein, & Robertson, 2008). Additionally, owners can buy sedatives from a veterinarian and administer them to the horse; however, incorrect administration of these drugs can cause death of the horse. Furthermore, in some barns, clipping can occur once every two weeks, which can result in repetitive sedation of the horses. Sedating horses often requires veterinary assistance when the owner is unable to administer IV shots, which can be costly and time consuming for handlers.

As an alternative to more invasive procedures, Gough (1999) evaluated the effects of playing a tape recording of clippers buzzing near ponies while they were eating to reduce head tossing when clippers were placed on their neck. They found decreases in head tossing in all the ponies. He conceptualized the effect to be a result of classical conditioning: an aversive stimulus was paired with food to reduce the problem behavior. Although Gough found a substantial effect, the procedure was only tested on the neck of the horse, which is not an area that typically results in a reaction from the clippers (Gough 1997).

A systematic way of teaching a horse to stay still during prolonged clipping is needed. The process needs to be something that horse handlers could easily learn and implement quickly and be related to the maintenance of the problem behavior. It may be possible to use negative reinforcement to teach horses to be still during clipping by removing the clippers for desired instead of undesired reactions.

Negative reinforcement has been used extensively in horse training. While some trainers are very skilled at using negative reinforcement to teach new behaviors, other trainers do not understand how to use it well. Horse trainers sometimes teach new behaviors by using a progression of gradually more aversive stimuli. For example, if the horse does not respond to a light squeeze of the rider's leg, the rider may give a harder squeeze. If this does not work, the rider may escalate to kicking the horse or using spurs or a crop. The horse learns that it can completely avoid the more aversive stimuli if it responds to the initial stimulus. In other cases, the trainer uses a lot of pressure at first until the horse complies. The trainer then gradually reduces the pressure to a minimal amount. McLean (2005) discussed these methods in detail in an overview of negative reinforcement applied in horse training. In particular, he explained how problem behaviors can arise from mixed signals from the handler, reinforcing inconsistent responses, not reducing pressure in the aids, and an absence of shaping. Importantly, McLean discussed that "incorrect [negative reinforcement] is responsible for a considerable amount of training failures, resulting in wastage" (p. 247). The incorrect application of negative reinforcement raises ethical concerns if it leads to problem behaviors that make a horse unusable. However, McLean also stated that "when negative reinforcement is achieved correctly, calmness in the animal is the outcome" (McLean, p. 251). If negative reinforcement is applied correctly, the trainer should have to use only mild pressure throughout the entire training procedure and results should be obtained quickly.

Negative reinforcement has also been used throughout applied behavior analytic literature, yet it has not been studied as extensively as positive reinforcement (Iwata, 1987; Smith & Iwata 2019). Iwata (1987) and Iwata and Smith (1987) described some ways of treating problem behavior maintained by negative reinforcement. In his 1987 paper, Iwata listed extinction, differential reinforcement, and punishment as possible solutions. In Iwata (1987), examples are listed of each.

A study by Heidorn and Jensen (1984) illustrated escape extinction as a treatment for self-injurious behavior (SIB) which is found to be maintained through escape from demand. When the client is presented with a demand and the SIB occurs, the procedure entails following through with physical prompting until the demand is completed. A gradual increase of criteria occurs once the SIB decreases in response to the demand. Escape extinction would not be practical for clipping horses because it may produce reactions which could endanger both the handler and the horse. To explain, if a handler tried to force a horse to be still while continually increasing the criteria during clipping, a horse might respond with a large reaction such as a rear or kick. This would likely force the handler to remove the clippers and reinforce this unwanted behavior.

Both differential positive reinforcement and differential negative reinforcement can also be used to treat behavior maintained by negative reinforcement. Iwata, Dorsey, Slifer, Bauman, & Richman (1982) observed the effect of differential positive reinforcement during the evaluation of the functional analysis assessment tool. They provided praise and tangible positive reinforcement for compliance with demands, and a 30 second time out for noncompliance. Their results showed that differential positive reinforcement was not enough to completely suppress problem behavior maintained by negative reinforcement. Vollmer, Marcus, & Ringdahl (1995) evaluated differential negative reinforcement to treat SIB by providing escape noncontingently, as well as for the absence of SIB. They had two participants whose functional analysis results indicated that their SIB was maintained by escape from demands. As treatment, they were exposed to a condition in which escape was provided noncontingently on a fixed time schedule, as well as a condition in which escape was provided for omission of SIB. They found that escape from demand was effective in reducing SIB in both conditions. Differential positive reinforcement could be used to teach horses to be compliant during clipping. This could be done through clicker training, with the handler providing clicks and treats if the horse remained still while the clippers were used on different parts of the body. Differential negative reinforcement could also be used to teach horses to be compliant through intermittent breaks on a fixed time schedule or on a DRO schedule as described in Vollmer et al. (1995). However, differential positive reinforcement may not address the avoidance behavior, which could result in the resurgence of problem behavior. Differential negative reinforcement is most likely to be useful here.

Iwata also said punishment can be used but is rarely studied in applied settings. In terms of teaching horses to accept clipping, punishment may be unproductive because the clippers are already aversive. The horse engages in unwanted behaviors such as walking backwards, throwing up its head, or rearing in order to avoid the clippers. Adding punishment to this situation might do more harm than good because it may make the clippers more aversive, which could further increase the avoidance behaviors. If this occurred, an even stronger punisher would then have to be used.

At the end of his paper, Iwata (1987) ended with a note of caution: that although negative reinforcement has been proven effective, it could be "considered more intrusive than punishment" (Iwata p.374). He cited the reason that negative reinforcement uses aversive stimulus removal contingent on the absence of behavior rather than occurrence. In other words, negative reinforcement is not being used to train a response, but rather to train an absence of responding. Alternatively, negative reinforcement may be useful if it is applied in small amounts and removed contingent on an alternative behavior or an approximation to an alternative behavior through the use of shaping (Hineline & Rosales-Ruiz, 2013; Catania, 2013).

Dawson, Piazza, Sevin, Gulotta, Lerman, and Kelly (2003) evaluated the treatment of a child with food refusal using escape extinction. They compared a procedure that used high probability instructions before the instruction take a bite and a procedure that used escape extinction. They found that escape extinction was the most effective with the child taking all bites presented. This procedure used just escape extinction; no shaping was used. Escape extinction applied in this manner is unlikely to be effective when clipping horses because a handler would be unable to safely prevent escape due to the size of the animal.

Treatment packages in applied settings often combine negative reinforcement with other procedures. For example, Wolff and Symons (2012) used a combination of negative reinforcement, graduated exposure, and positive reinforcement to address a blood-injuryinjection phobia in an adult male with autism and intellectual disability. The participant also had a history of medical noncompliance. During the study, the participant was required to hold his arm on a table for a determined length of time (10-15 s) while one therapist held a needle at a certain distance. At the end of each successful trial, the therapist holding the needle moved out of view, while another therapist provided positive reinforcement. Over successive trials, the needle was moved closer to the participant. Although this study did use a series of approximations, it is worth noting that it did not involve behavior shaping. The negative reinforcement contingency was designed so that the aversive stimulus was removed on the basis of intervals of time, independent of the participant's behavior. Also, partway through the treatment, the participant began verbalizing "no" and started to refuse to present his arm. As a result, the authors found it necessary to add a safety signal to prevent the adventitious reinforcement of undesirable behavior.

The purpose of the current study is to evaluate a safe method for teaching horses to be still during clipping, using a negative reinforcement shaping procedure. It should be possible to start with the aversive stimulus at a very low level. With the right starting point, there should be very little or no problem behavior, emotional reactions, or extinction-induced variability. After the clippers are presented, the handler can observe the horse's response. If unwanted behavior does occur, the handler can wait for an appropriate alternative response and remove the clippers contingent on this alternative behavior. If unwanted behavior does occur, it should occur at a low magnitude, which will be easier to extinguish. The procedure can progress through a series of shaping steps. The hand will be used first to run over the horse's body, then the clippers will be introduced while they are off, and then finally the clippers will be used normally with them turned on. In this way, the horse can learn all the pre-requisite skills before the actual clipping occurs in an errorless style teaching process (Etzel & LeBlanc, 1979).

CHAPTER 2

METHOD

Subjects

Eight horses participated in this experiment. They were all kept at the same barn and owned by the same person. The horses were rescued with unknown backgrounds. There were four geldings and four mares ranging in age from 5-15 years. The horses included a mustang, a horse rescued from an auction house, four off the track thoroughbreds beginning second careers, and two ponies. None of the horses had prior known experience with clipping due to the nature of their unknown past, and no known history of problem behavior during clipping. All had varying experience with handling, ranging from halter training to training under saddle. At a minimum, the horses had to be halter trained and trained to stay still while tied to be included in the treatment procedure.

Setting and Materials

All horses experienced treatment in the aisle of the barn. The horses were used to being tied in this aisle for daily grooming activities and saddling. The barn aisle dimensions were 4x14 meters. The aisle of the barn had four stalls on one side, with the tack room and storage area on the other side. One end of the aisle was open and the other side closed with a door leading out to a pasture. Seven of the horses were clipped in the aisle of the stabling area while tied to the stall doors, and one horse had to move into a stall mid-treatment due to the fact that there were too many horses tied in the aisle on that day. The horses were all clipped in a lighted area near an electrical outlet used for the clippers. Weather conditions varied on the days of the clipping and included rain, wind, and sun.

All horses were clipped with an Andis AGC2 Super 2-Speed Professional Clipper with Detachable Blade clippers. While in use, the clippers were on the fastest blade speed. An extension cord was used if needed to connect to the outlet. All sessions took place with a GoPro video camera mounted across the barn aisle.

Measurement and Reliability

The dependent variable measured in the experiment was the number of trials it took the horse to complete the training sequence. A successful trial was defined as an instance in which the horse exhibited no reaction to the clippers, that is, did not break contact with the hand (phase 1) or clippers (phase 2 and 3). An unsuccessful trial was defined as when the horse broke contact with the hand or clippers. This break of contact could be as small as a muscle twitch if it resulted in a loss of contact between the hand or clippers and the horse. Examples of a reaction could include stomping a hoof, moving away with the body, walking forward or backward, lifting or shaking the head, pinning the ears, etc. If a reaction occurred, a subsequent still response was necessary for the handler to remove the contact of the hand or clippers from the horse. Still responses were a wiggling of the lips, a deep breath, chewing of the jaw, or lowering of the head. The duration of each clipping was also recorded via GoPro video timestamps.

All sessions were recorded using a GoPro. The experimenter recorded a tally next to the shaping step (see table 1) when the horse had a reaction during the procedure. Reliability was calculated as the percent agreement between an independent observer watching the video and the experimenter recording live. The formula for this calculation was number of agreements over agreements plus disagreements times one hundred. Agreements were determined when the experimenter and the independent observer’s tally of reactions matched completely for an entire step. Disagreements were when the experimenter and independent observer’s tallies of reactions did not match per step. There were 49 steps in the procedure, so there were 49 times in each video of potential agreement or disagreement. The independent observer was an undergraduate student in applied behavior analysis who had horse experience and was trained to identify reactions. Three videos, Poppy, Betty, and Chloe, were selected quasi-randomly, making sure the lighting and video quality were adequate for observation. Reliability was collected for the entirety of the three videos which represents 37.5% of all data. The independent observer was then trained on a separate clipping video to identify examples and non-examples of reactions. The independent observer was then given the three videos to record continuous independent data on the entirety of each session. Each of the three phases were represented in the calculations. IOA was calculated by comparing total agreement between the experimenter and independent observer for each step over the entirety of the session. The percent agreement was 98% for Poppy, 98% for Chloe, and 100% for Betty for the three different samples.

General Procedure

To begin the session, each horse was haltered, then tied to a hay string tied on a stall door in the aisle of the barn. The experimenter started the GoPro and then followed the list of shaping steps. The first shaping steps involved the experimenter running her hand over the parts of the horse's body following the 13 steps of phase 1 (see table 1). This was a continuous motion that did not break contact between the hand and the body, with the experimenter touching each part for a few seconds if there was no reaction. Then the experimenter followed a similar procedure for the shaping steps in phases 2 and 3. Upon completion of the procedure, the horse was returned to the stall/pasture that they were in before. The whole training procedure was completed in one training session. There were 49 steps from beginning to end.

Phase 1

During Phase 1, the experimenter followed the first 13 steps using only the hand to touch the horse. It started with the handler touching the horse's shoulder and concluded with touching the horses' poll (The area just behind the ears.) At each step, if the horse had no reaction, that is, did not move during the touch, then the handler would move to the next step in the sequence. If the horse did have a reaction, that is, the horse moved away and broke the contact, then the handler would reinstate and keep the contact until the horse exhibited a still response. This response could be a deep breath, a lowering of the head, chewing of the jaw, or relaxation of muscle tension. The handler would then remove the hand, walk away, and mark a tally for an unsuccessful trial. Intertrial intervals were untimed but lasted approximately from 1 to 5 minutes. The handler would then return to the horse and begin phase 1 again, by touching the shoulder. The handler would run her hand over the horse in the same continuous motion as before, following the steps, until the experimenter reached the place of the reaction. If the horse had a reaction again, the experimenter would follow the same procedure as before. If the horse had no reaction, or a still reaction, the handler would remove her hand, walk away, and mark a successful trial. When the horse had three successful trials in a row, the next trial moved on to the next step. Phase 1 was completed when all the steps were completed within that phase.

Phase 2

During Phase 2, the experimenter followed the 18 steps using the clippers (off) to touch the horse. This phase was longer by five steps from phase 1. The first four steps were included to slowly decrease the distance of the clippers to the horse, and the last step, (back away from horse) was included to ensure the experimenter is away from the horse when they started the clippers in phase 3.

Phase 2 started with the handler holding the clippers three feet to the horse and moving closer until the clippers touched the shoulder. If the horse had no reaction, i.e., did not move during the step, then the handler would move to the next step in the sequence in the same fluid motion as in phase 1, concluding with backing away from the horse after touching the clippers to the poll. If the horse did have a reaction, the same procedure as in phase 1 was followed until the horse met the criteria of three still/no reaction trials required to move onto the next step in the sequence. Phase 2 was completed when all the steps were completed within that phase.

Phase 3

During Phase 3, the experimenter followed the same 18 steps using the clippers on the second speed setting. Phase 3 started with turning the clippers on away from the horse and concluded with backing away from the horse after clipping the poll. The same procedure as described in Phase 1 and 2 was conducted, except that the clippers were turned off after removal. Procedurally, Phase 3 differed slightly for step 48 (Touch clippers to ear. Clip). If a horse reacted at this step and the hair was not being clipped yet, the experimenter would follow the general procedure. However, if the horse broke contact by shaking its head while the experimenter was physically clipping the ear, this did not count as a reaction. In this case, the experimenter paused briefly and allowed the horse to shake its head which remove the loose hair from the area. This made the horse more comfortable and allowed the experimenter to make the hair clip more aesthetically pleasing.

Experimental Design

This study implemented a changing criterion design. The whole experiment was divided into three phases. Each phase constituted a different criterion: first with just the experimenter's hand, then with the clippers turned off, and finally with the clippers turned on. At each of the 49 steps, there was an opportunity for the horse to display unwanted behavior. If the horse reacted, the experimenter implemented the negative reinforcement procedure until the horse displayed only appropriate behaviors. At this point, the experimenter moved on to the next step. In total, the procedure, which involved differential negative reinforcement of an alternative behavior, was applied on 17 occasions.

This study did not include a formal baseline. This decision was made because previous research has indicated that horses usually display negative reactions to the clippers (Gough, 1999, Ali et al., 2017, Yarnell et al., 2013). The nature of this study was to evaluate a fast, efficient method to introduce clippers to horses. A baseline that tested the horse's initial reaction to the clippers may have evoked unwanted behavior, which could have been inadvertently reinforced by the removal of the clippers.

CHAPTER 3

RESULTS

Figure 1 displays the cumulative number of steps completed for each participant. Each graph displays the results of one horse. The y-axis depicts the step number of the procedure listed in Table 1, and the x-axis depicts the trial number. Lines denote the change between phases. The graphs are arranged from least trials to most trials starting with Sky in the top left and ending with Mustang Mare in the bottom right.

Sky: Sky had no reactions in phase 1, phase 2, or phase 3. Sky completed the 49 step treatment in 49 trials.

Ardi: Ardi did not have a reaction in phase 1. In phase 2, Ardi had two reactions at step 27. Reactions occurred on trials 27 and 28, and Ardi met criteria at trial 32. In phase 3, Ardi had no reactions. Ardi completed the treatment in 53 trials.

Betty: Betty did not have a reaction in phase 1. In phase 2, Betty had three reactions at step 29. Reactions occurred on trials 29, 30, and 31. Betty met criteria at trial 34. In phase 3, Betty had no reactions. Betty completed the treatment in 54 trials.

Chloe: Chloe had one reaction in phase 1 at step 10. The reaction occurred on trial 10, and Chloe met criteria in trial 13. In phase 2, she had two reactions at step 27. The reactions occurred in trials 30 and 31. Chloe met criteria at trial 34. In phase 3, Chloe had three reactions at step 48. The reactions occurred in trials 56, 57, and 58. Chloe met criteria at trial 60. Chloe completed the treatment in 61 trials.

Poppy: Poppy had no reactions in phase 1. In phase 2, he had one reaction at step 20. The reaction occurred in trial 20. Poppy met criteria at trial 23. He had 8 additional reactions in phase

2 at step 27. The reactions occurred in trials 30, 31, 32, 33, 35, 36, 37, and 38. Poppy met criteria in trial 41. He did not have a reaction in phase 3. Poppy completed the treatment in 63 trials.

OTTB Mare: OTTB Mare had 4 reactions in phase 1 at step 10. The reactions occurred in trials 10, 11, 14, and 17. OTTB Mare met criteria at trial 20. In phase 2, she had two reactions at step 28. The reactions occurred in trials 38 and 40. OTTB Mare met criteria at trial 43 OTTB Mare completed the treatment in 64 trials.

Brown Chapel: Brown Chapel had no reactions in phase 1. In phase 2, he had four reactions at step 29. The reactions occurred in trials 29, 30, 31, and 32. Brown Chapel met criteria at trial 35. In phase 3, he had two reactions at step 44. The reactions occurred in trials 50 and 51. Brown Chapel met criteria at trial 54. He had 5 additional reactions at step 48. The reactions occurred on trials 58, 59, 61, 62, and 63. Brown Chapel met criteria at trial 66. Brown Chapel completed the treatment in 67 trials.

Mustang Mare: Mustang Mare had no reactions in phase 1. In phase 2, she had two reactions at step 27. The reactions occurred in trials 27 and 28. Mustang Mare met criteria at trial 31. In phase 3, she had a reaction at step 39. The reaction occurred at trial 43. Mustang Mare met criteria at trial 46. Additionally, in phase 3, she had one reaction at step 40. The reaction occurred at trial 47. Mustang Mare met criteria at trial 50. Also, in phase 3, she had another reaction at step 44. The reaction occurred at trial 57. Mustang Mare met criteria at trial 60. Finally, in phase 3, she had 8 reactions at step 48. The reactions occurred at trials 64, 65, 66, 67, 68, 70, 71, and 72. Mustang Mare met criteria at trial 75. Mustang Mare completed the treatment in 76 trials, the maximum of the group.

Figure 2 displays the total time from beginning of the procedure to the end of the procedure. Duration was omitted for two of the horses. Sky was full body clipped, which took significantly longer due to type of clip. Mustang Mare was omitted due to a GoPro malfunction and resulting inaccurate timing. Ardi’s duration was 15 minutes and 37 seconds, the shortest duration in the group. Brown Chapel’s duration of treatment was 24 minutes, 7 seconds. Betty’s duration of treatment was 30 minutes 11 seconds. OTTB Mare’s duration of treatment was 32 minutes and 25 seconds. Chloe’s duration of treatment was 33 minutes 31 seconds. Poppy’s duration was the longest at 63 minutes and 41 seconds. There was no set intertrial interval for the experiment, but the durations are included as a social validity measure.

CHAPTER 4

DISCUSSION

Eight horses were successfully clipped without the use of a twitch or drugs in one session. Session duration ranged in length from 15 minutes and 37 seconds to 63 minutes and 41 seconds. Number of trials in each session ranged from 49 trials to 76 trials. The number of steps that horses reacted to during the procedure ranged from 0 to 5; with most horses having 1, 2, or 3 reactions. These results show that it is possible to teach a horse to cooperate with clipping by using a negative reinforcement shaping procedure.

Common methods to reduce problem behavior during clipping are the twitch and drugs. These tools are valued for their quickness in calming the horse. However, twitches can be ineffective in keeping the horse still during a procedure, and drugs can be costly and time consuming.

Considered over a long period, the time and effort it takes to twitch and sedate is more extensive then the current shaping procedure. While it is faster in the moment to sedate the horse or to twitch them and force them to be still; this may cause the horse to be less likely to be still in the future because they have had an aversive experience associated with the clipping. In addition, neither method offers any teaching of an alternate behavior. These methods can be helpful in the moment but can become a greater problem for later.

In contrast, the procedure used here systematically teaches desired alternative behavior through shaping. By using small shaping steps to the target response of being still while the handler clips the hair, the handler could respond to smaller reactions, such as a muscle twitch, far before they became a a large reaction, such as rearing or kicking. When a small reaction occurred, the handler waited and removed the clippers when the horse exhibited an appropriate alternative response. This taught the horse that only appropriate behavior would remove the clippers and allowed the experimenter to avoid big reactions such as rearing, kicking, and bolting.

By avoiding these large reactions, the safety of the horse and handler is immensely improved. Only two of the eight horses had a reaction in phase 1, likely due to the resemblance of phase 1 to their daily grooming procedures. However, it is interesting to note that two horses did react in phase 1. This further illustrates the importance of breaking down the shaping steps into small approximations. If this phase was skipped for those two horses, they might have had bigger reactions in the next phase.

There were similarities in parts of the body where the horses had reactions. Seven out of eight of the horses reacted to the muzzle and/or the ears. Five of these horses reacted to the muzzle, and four reacted to the ear. The reactions consisted of a raising of the head away from the clippers at the muzzle and pulling the head away from the clippers at the ear. In both cases the head would move quickly in the opposite direction from the clippers. Other reactions were seen above the eye, on the legs, and at the neck. Two of the eight horses had reactions at the legs. These reactions looked like stomping or walking away from the handler. Only two of the horses (Chloe and Brown Chapel) had reactions at the same parts of the body for multiple phases. Chloe reacted to the muzzle twice in phases 1 and 2 while Brown Chapel reacted to the ears in phases 2 and 3. For the other six horses, the horses did not have a reaction at the same spot for subsequent phases.

The current procedure used a series of small steps to ensure that the horse’s level of reaction would be kept to a minimum. The horse was tied loosely to the wall by the lead rope. This allowed the horse to move a few steps in any direction while remaining tied. There was a piece of hay string connecting the lead rope to the wall. If the horse had a large reaction, the horse would have been able to break completely free without destroying the stable or itself. However, because of the small steps, these types of large reactions did not occur, and all horses remained tied during the procedure.

This procedure was fast, with the maximum amount of time spent on the entire procedure plus clipping at 63 minutes and 41 seconds. Ideally, the procedure will go faster and faster when the handler clips the horse in the future. These results indicated that the requisite time for both procedure and clipping are not prohibitive. Even though the current study did not measure the time during the intertrial interval (and sometimes the breaks between trials were up to five minutes long) and even though, depending on the length of coat, the clipping process often took a long time, the procedure was still done in most cases under an hour. This illustrates practicality of the procedure.

Future studies should extend the results to horses currently exhibiting problem behavior during clipping and to other populations. Notably, the horses used in this study had unknown histories of learning with clippers, and due to omission of a formal baseline it is unknown if they had problem behavior with clippers. Future studies should evaluate this procedure as a way to introduce clippers as a treatment for existing problem behavior. Also, if this procedure can work with horses, it is likely that it will work with other animals and with humans. Many dogs dislike being groomed, and this procedure could be used to teach them to be still while being clipped and during other grooming procedures. Future directions could also include evaluation of the procedure for use in teaching individuals with intellectual disabilities to be still during hair cutting and nail trimming. The procedure should also be evaluated for ease in transmission to a new handler. The experimenter in this study has had extensive experience with horses. To be a reliable technology, the procedure must be easy to teach to those with less experience.

Overall, this study demonstrates the effectiveness of shaping with negative reinforcement. All eight horses learned to be clipped in around an hour or less, while displaying only a few unwanted behaviors. The procedure was quick and simple, which makes it a practical procedure for animal trainers.

Table 1

Shaping Steps for Each Phase of the Study

Phase 1	Phase 2	Phase 3
1. Tounch horse shoulder	14. Hold clippers 3 ft. to horse.	32. Turn on clippers.
2. Touch horse flank.	15. Hold clippers 2 ft. to horse.	33. Hold clippers 3 ft. to horse.
3. Touch horse haunches	16. Hold clippers 1 ft. to horse.	34. Hold clippers 2 ft. to horse.
4. Run hand down front left	17. Hold clippers 6 in. to horse.	35. Hold clippers 1 ft. to horse.
5. Run hand down front right	18. Touch clippers to shoulders (off)	36. Hold clippers 6 in. to horse.
6. Run hand down back left	19. Touch clippers to flank.	37. Touch clippers to shoulders.
7. Run hand down back right	20. Touch clippers to haunches	38. Touch clippers to flank.
8. Touch horse neck	21. Run clippers down front left	39. Touch clippers to haunches
9. Touch horse cheek	22. Run clippers down front right	40. Run clippers down front left (clip)
10. Touch horse muzzle	23. Run clippers down back left	41. Run clippers down front right (clip)
11. Touch horse above eye	24. Run clippers down back right	42. Run clippers down back left (clip)
12. Touch horse ear	25. Touch clippers to neck.	43. Run clippers down back right (clip)
13. Touch horse poll	26. Touch clippers to cheek.	44. Touch clippers to neck.
	27. Touch clippers to muzzle.	45. Touch clippers to cheek. (clip)
	28. Touch clippers to above eye.	46. Touch clippers to muzzle. (clip)
	29. Touch clippers to ear	47. Touch clippers above eye
	30. Touch clippers to poll	48. Touch clippers to ear. (clip)
	31. Back away from horse.	49. Touch clippers to poll. (clip)

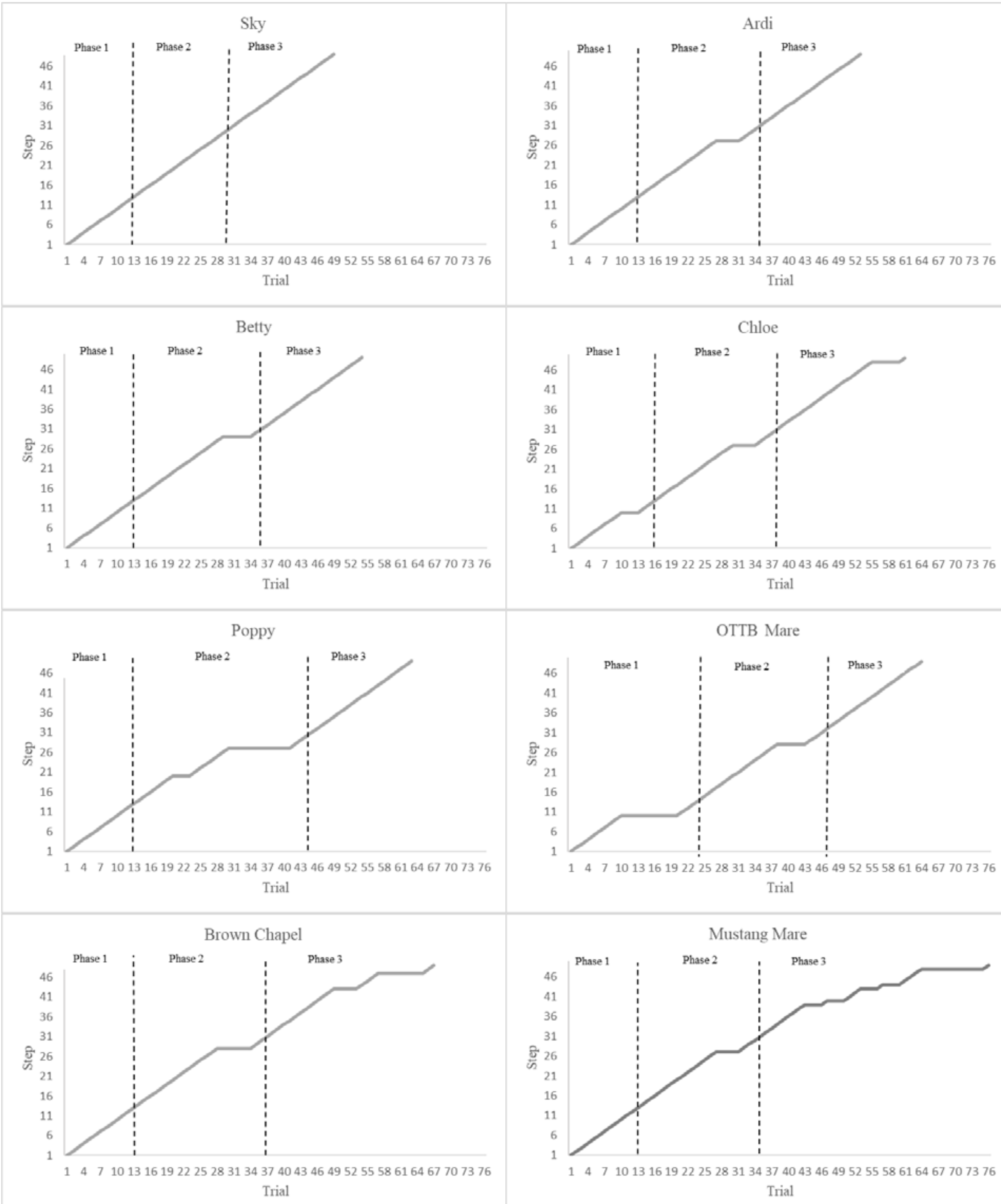

Figure 1. The results of the eight horses are grouped together. Phase 1 is just the hand, phase 2 is the clippers (off) and Phase 3 is the clippers (on). Each horse is listed with the x axis 1-76 because the maximum number of trials was 76.

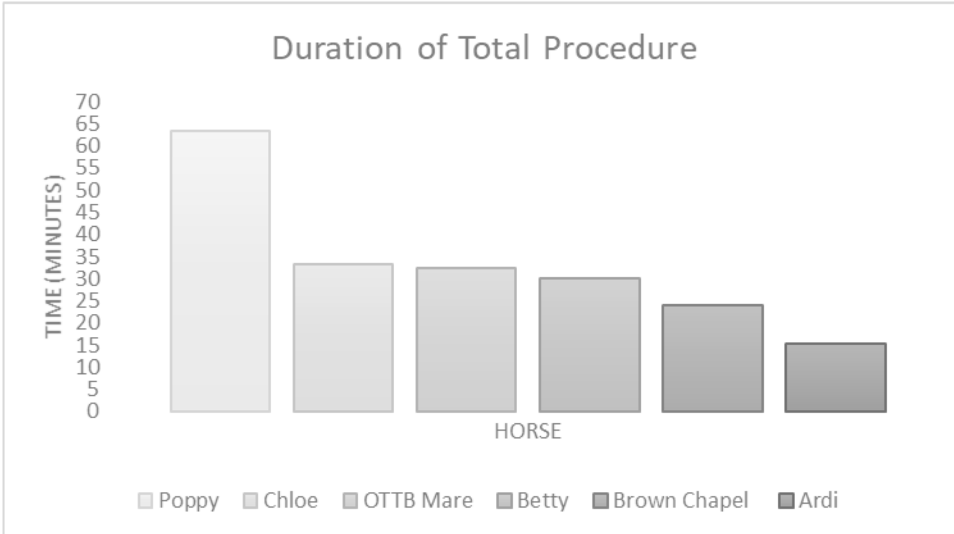

Figure 2. The time spent clipping is reported in minutes for each horse.

REFERENCES

Ali, A. B., Gutwein, K. L., & Heleski, C. R. (2017). Assessing the influence of upper lip twitching in naive horses during an aversive husbandry procedure (ear clipping). *Journal of Veterinary Behavior: Clinical Applications and Research*, 21, 20-25.

Catania, A. C. (2013). *Learning.* Cornwall on Hudson, NY. Sloan Publishing.

Cooper, J. O., Heron, T. E., & Heward, W. L. (1987). *Applied behavior analysis*. Upper Saddle River, NJ. Pearson.

Dawson, J. E., Piazza, C. C., Sevin, B. M., Gulotta, C. S., Lerman, D., & Kelley, M. L. (2003). Use of the high-probability instructional sequence and escape extinction in a child with food refusal. *Journal of applied behavior analysis, 36*(1), 105–108. doi:10.1901/jaba.2003.36-105

Etzel, B. C., & LeBlanc, J. M. (1979). The simplest treatment alternative: The law of parsimony applied to choosing appropriate instructional control and errorless-learning procedures for the difficult to teach child. *Journal of Autism and Developmental Disorders*, 9(4), 361–382.

Gough, M. R. (1997). Clipping horses. Equine Veterinary Education, 9(3), 161-165.

Gough, M. R. (1999). A note on the use of behavioural modification to aid clipping ponies. *Applied Animal Behaviour Science*, 63(2), 171-175.

Heidorn, S. D., & Jensen, C. C. (1984). Generalization and maintenance of the reduction of self-injurious behavior maintained by two types of reinforcement. *Behavior Research and Therapy,* 22, 581-586.

Hineline, P. N., & Rosales-Ruiz, J. (2013). Behavior in relation to aversive events: Punishment and negative reinforcement. In G. J. Madden, W. V. Dube, T. D. Hackenberg, G. P. Hanley, & K. A. Lattal (Eds.), *APA handbook of behavior analysis, Vol. 1. Methods and principles* (pp. 483-512). Washington, DC, US: American Psychological Association.

Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1982). Toward a functional analysis of self-injury. *Analysis and Intervention in Developmental Disabilities*, 3, 1-20.

Iwata, B. A., Smith, R. G. (1987). Negative Reinforcement. In Davis, A. C. (Ed.), *Applied Behavior Analysis* (pp. 291-304). Upper Saddle River, NJ. Pearson.

Iwata, B. A. (1987). Negative reinforcement in applied behavior analysis: an emerging technology. *Journal of applied behavior analysis*, 20(4), 361-78.

McLean, A. N. (2005). The positive aspects of correct negative reinforcement. *Anthrozoös, 18*(3), 245-254

Sanchez, L. C., Elfenbein, J. R., & Robertson, S. A. (2008). Effect of acepromazine, butorphanol, or N-butylscopolammonium bromide on visceral and somatic nociception and duodenal motility in conscious horses. *American journal of veterinary research*, 69(5), 579-585.

Smith, R. G., Iwata, B. A. (2019). Negative Reinforcement. In *Applied Behavior Analysis* (pp. 287-299). Upper Saddle River, NJ. Pearson.

Voith, V. L. (1986). Principles of learning. *Veterinary clinics of North America: Equine practice*, 2(3), 485-506.

Vollmer, T. R., Marcus, B. A., & Ringdahl, J. E. (1995). Noncontingent escape as treatment for self-injurious behavior maintained by negative reinforcement. *Journal of applied behavior analysis*, 28(1), 15-26.

Wolff, J. J., & Symons, F. J. (2013). An evaluation of multi-component exposure treatment of needle phobia in an adult with autism and intellectual disability. *Journal of applied research in intellectual disabilities*, *26*(4), 344-348.

Yarnell, K., Hall, C., & Billett, E. (2013). An assessment of the aversive nature of an animal management procedure (clipping) using behavioral and physiological measures. *Physiology & behavior*, 118, 32-39.