The training of horses used in horse assisted interventions

- practice and reflections from practitioners

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The training of horses used in horse assisted interventions
Practice and reflections from practitioners

Träningen av hästar som används i hästassisterade interventioner
Praktik och reflektioner från verksamhetsansvariga

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Abstract

Horse assisted interventions (HAI) used to be included in the healthcare system in Sweden. They are no longer and have since then become largely privately run independent businesses. There are no regulations in place for controlling the welfare of the horses which lies in the hands of the operations manager (practitioner). Horses used for HAI are often exposed to ethological challenges in their daily lives as part of the business. The aim of this study was to investigate the training methods used to prepare and maintain the horses in the business with the goal of investigating to what extent training methods are based on scientific learning principles.

The aims of this study include:

1. What training methods do HAI practitioners use within Sweden and do they align with scientific research on ethology and learning principles?
2. Do HAI practitioners understand the underlying causes and influences on horse behaviour and learning?
3. How do HAI practitioners reflect on their applied training, and the applied training of other trainers?

Eight HAI practitioners were observed training a horse used in their business over four training exercises and one desensitisation exercise. They were also interviewed regarding their use of training methods and views on human-horse communication. Results were evaluated in accordance with the First Training Principles published by the International Society for Equitation Science (ISES). Results showed that the principles were followed in training in a rudimentary fashion where basic responses were seen but the finer aspects of training were lacking. Practitioners placed high value on the emotional well-being of the horse and identified their horses as colleagues or friends. They all placed themselves in the relationship-based training category although all were eclectic in their choice of training methods. In practice, overall, the application of pressure and timing were relatively low, and desensitisation methods were in line with traditional scientific thinking. However classical conditioning, shaping use of cues and training of self-carriage could all be improved.

Keywords: horse assisted interventions, training principles, practitioners

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Abbreviations

HAA	Horse-assisted activity
HAI	Horse assisted interventions
HAL	Horse-assisted learning
HAT	Horse-assisted therapy
ISES	The International Society for Equitation Science
SLU	Swedish University of Agricultural Sciences

1. Introduction

Horse assisted interventions (**HAI**) is a field of complementary therapy which has been used in Sweden since the 1950s (Hedenborg, 2017). In recent years it has been growing in popularity and gaining attention due to its widespread applicability (Håkansson et al., 2021). HAI covers three types of interventions in combination with horses. These include, horse assisted therapy (**HAT**), horse assisted learning (**HAL**) and horse assisted activities (**HAA**) (ibid). Therapy with horses can be used on its own but is often used in conjunction with an existing psychological treatment plan (Håkansson et al., 2021).

Examples of situations where HAT can benefit therapeutic programs include veterans with post-traumatic stress disorder (Zhu et al. 2021) and people with psychosis (Hultsjö & Jormfeldt 2021). HAT can also be effective at treating autism (Malcolm et al. 2018) and can be used to teach life skills and emotional regulation (Perkins 2018). HAL could include integrating contact with horses after school as a goal-oriented activity or as a way of reintroducing a student to school after a period of absence (Håkansson et al., 2021). HAA includes activities for promoting wellness in healthy people such as personal development, coaching or activities for those needing assistance in their daily lives. It can be used after a completed therapy program as further support or as a support for companies looking to improve inter-personal communication through team-building exercises (ibid).

HAI arose in Sweden following the polio epidemic (Håkansson et al., 2021). During the epidemic, Danish Lis Hartel became the first woman to attain an Olympic medal in dressage in 1952 (Hedenborg, 2017). Hartel was also the first rider competing at the Olympics after suffering from polio which left her paralysed from the knees down (ibid). Following Hartel, HAI has been used in the Swedish healthcare system since the late 1950s (Håkansson et al., 2021). While HAI were originally included in the public healthcare system, most HAI providers today are private with varied backgrounds (ibid). As a result, the situations for both horse welfare and human safety are undocumented and likely inconsistent. Considering that HAI is a growing sector in Sweden today it is vital to create a better understanding of conditions for the horses providing services to patients around Sweden.

The horse's role in HAI can vary greatly depending on the tasks involved in the type of intervention the horse is involved in. Note that the HAI practitioner or other

employee is always present in all interactions between the horse and any clients, in all interventions. In HAT, for example, the horse can be used as i) a facilitator in a psychological therapy or coaching programme or ii) a facilitator used in a physiotherapy programme. Depending on the setup the horse may meet the client one-on-one on in a group setting. Psychological therapy may involve talk therapy in the presence of a single horse, several horses or in conjunction with an activity such as hand-walking the horse out in the forest while talking. "Relaxing on a horse" is another option offered, where the client may sit or lie on a stationary horse, often in the stables and covered with a blanket. Physiotherapy with horses involves a ridden session, with the HAT practitioner leading the session, and often the horse too. It may include one or two extra helpers walking on either side of the client to ensure their safety. This setup may occur with a single horse and client or as a group session. Driving can also be used in a therapy session where the client and practitioner sit in a cart behind the horse. In all settings the care of the horse before and after the session may be an integral part of the intervention.

In HAL and HAA activities may be similar to those described above or may involve other activities. These could include, group setting with either a single or a group of horses. The activity could involve simply interacting with a horse in its paddock or working with the horse from the ground, often loose, and trying to get the horse to perform in a certain way or move to a certain place. It may also include riding or driving. The care-taking and stable work are also here important aspects included in the activities.

The requirements of the horse vary depending on the type of activity or therapy the horse is used for. Sometimes the horse needs to be very well-trained in order to stand still while a person with a physical or neurological disability climbs atop its back, and to stay calm throughout their time together. It needs to be comfortable with up to four people standing by its sides and walking with it. On the other hand, many practitioners intentionally do not train their horses on how they want them to act in certain situations because they use the horse's natural personality, likes, dislikes and expressions of these as the basis of their therapy. All variations in-between exist and makes HAI unique in the equine industry in the plethora of approaches to horse-human interactions and what is required of the horse.

1.1 Evaluation of training methods

The International Society for Equitation Science (**ISES**) is made up of scientists and researchers covering all aspects of equine-related studies. The ISES has published a set of Training Principles (**TP**) (International Society for Equitation Science, 2018), backed up by scientific study and based on the horses ethology and the principles of learning (Goodwin et al. 2008, 2009; Starling et al. 2016; McLean, 2018). In order to base the observations in this study on a reliable and established

framework, this set of training principles was used as a basis for development of the method of this study. As HAI is practiced internationally and results may be relevant to all operations, it was an added benefit to follow a set of internationally recognised principles with a sound basis. The training principles published by ISES are presented in Figure 1 and are further described in sections 1.3 and 1.4.

Before describing the principles in detail, a note must be made on the formulation of the principles. Principles one to four (TP1-4), and principle ten (TP10), all use the term "regard for" when describing the principle, as in "Regard for self-carriage". This is an optimal term when advocating the use of the scientific basis that currently exists as a ground on which to base ethical horse training. Principles five to nine (TP5-9), on the other hand, use the term "correct use of", when describing the principle, as in "correct use of desensitisation methods." This term is presumptuous in that it makes a judgement what is of correct or incorrect based on our current scientific knowledge.

One of the hallmarks of scientific study is that it is continuously questioned and updated. This is what makes a list of principles a sound basis for development, but care must be taken that we do not take them as the absolute truth, but rather, our current and most-updated knowledge. In the section below, covering the principle of "correct use of desensitisation methods" (section 1.3.1) for example, a trauma-informed description of desensitisation, based on the polyvagal theory (Porges, 2009), is introduced, which has not previously been described by ISES. The term "correct use of" may perhaps be better substituted with "the ethical use of" so that the principle "the correct use of desensitisation methods" would rather state "the ethical use of desensitisation methods" and so on, for TP9-5. Whilst a less clear statement, it does not presume to have already made an ethical judgement on the optimal application of the learning principles in respect to horse training.



Figure 1. Poster published by the International Society for Equitation Science showing their 10 First Training Principles.

1.2 Equine ethology

TP two to four of the ten ISES first principles regard the horses ethology, including natural behaviour, sensory abilities, and affective states (the horse's emotional state). Knowledge of horse ethology is the starting point when trying to alter a horse's behaviour, both for ethical and practical reasons.

Many aspects of equine ethology are not looked at in this study, especially those regarding the horse's welfare in the hours not in human company. A parallel study was run investigating the welfare of the horses but is currently unpublished.

The ethological points included in this study, based on the ISES principles in Figure 1, are outlined and described below.

1.2.1 TP 2: Regard for the nature of horses

Two aspects regarding the nature of horses are highlighted in this study, i) that we should avoid assuming a dominant role our interactions with our horses (ISES, 2018) and ii) that respect should be given for the inherent social needs of horses (ibid).

Dominance culture within human-horse interactions has been discussed within the scientific community (Hartmann et al. 2017). The concept that horses misbehave because that are trying to gain a higher position in the "pecking order" has little validation when equine ethology is considered (ibid). Hierarchical structures within horse herds are fluid (Houpt et al. 1978), in the sense that Horse A may be dominant to Horse B, who is dominant to Horse C. Horse C may then in turn be dominant to Horse A. The definition of 'being dominant to', in this case, means being able to move the horse away from a desired resource. Another form of leadership, the instigation of group movement, may be are carried out by different individuals or even several individuals simultaneously (Bourjade et al. 2009, 2015). It may also depend on the current motivations of the followers rather than the qualities of the instigator (Briard et al. 2015). Furthermore, when given a choice, horses prefer to approach humans displaying a submissive body posture significantly more than when displaying a dominant body posture (Smith et al. 2018b). As our goal in training horses is to achieve a desired behaviour, we need the horse's attention (Rochais et al. 2014), combined with a calm affective state, and attempting to demonstrate our dominance to them appears counterproductive in achieving these goals.

Respecting the social nature of horses is also included in Point 2 on the ISES First Principles list (Figure 1). The most obvious consideration here is the effect that separation from conspecifics can have on a horse. Horses are less stressed when housed in a group (Yarnell et al. 2015) and stress (measured by heart-rate variability) increases when young horses are trained in isolation versus with a companion (Hartmann et al. 2011). Group-housed young horses were seen to learn

faster than those housed individually and while the individually housed horses were seen to bite the trainer more than those housed in groups (Søndergaard & Ladewig 2004).

Tactile stimulation is an important horse-horse interaction carried out through allogrooming. Social bonding between foals can be measured by the repeated occurrence of allogrooming between two individuals (Crowell-Davis et al. 1986). Both intraspecies allogrooming and interspecies human-horse grooming can reduce the horse's heart rate when preferred spots on the horse are groomed (Feh & de Mazières 1993; Normando et al. 2003; Thorbergson et al. 2016). The use of tactile stimulation as a reward and bonding exercise would be showing regard for the horse's social nature, as well as and sensory abilities and emotional states (TP3-4).

1.2.2 TP 3: Regard for horses' mental and sensory abilities

ISES advises avoidance of over- or underestimating horses' mental (cognitive) abilities and avoiding long training sessions (Figure 1). There is a dearth of studies involving equine cognitive abilities and limitations, especially in-field, in terms of the effect of length and intensity of training sessions. Although one interesting study has looked at the effect of spaced training on horses learning speed (Holcomb et al. 2022). In the study, 29 horses were trained to cross a novel object via negative reinforcement (see section 1.3.2). Each horse received four minutes of training and four minutes of rest. Half of the horses received spaced-training (two min training, two min rest, two min training, two min rest) while the other half received massed-training (four min training, four min. rest). The spaced-training was so successful that 15/16 horses succeeded in meeting the criterion for completion (crossing the novel object eight times in a session) while only 5/13 of the massed-training horses reached the criterion. Spaced-training horses made faster progress and reached criterion for completion faster. The need for intermittent rest during novel object training is clearly vital.

The study of equine cognition covers various aspects of intra-specific and interspecific recognition and communication. Once it was discovered that horses can recognise and remember other horses based both upon on sound and appearance (Proops et al. 2009), as well as read each other's facial expressions (Wathan et al. 2016), the question arose of whether they can do it with humans too. Studies have since shown that horses recognise and remember humans based on both visual and auditory characteristics (Lampe & Andre 2012; Proops & McComb 2012). As well as recognising individual humans, horses also both read and respond emotionally to human facial expressions (Smith et al. 2016) as well as have appropriate emotional responses to human laughing and growling (non-vocal sounds) (Smith et al. 2018a). Horses also form associations with the human depending on the expressions they show (Proops et al. 2018). After having seen only a photo of a human for two minutes, horses will already have formed an emotional association

to that human, evident three to six hours later (ibid). Knowing that human expressions evoke emotional responses in horses gives cause for reflection on both the interactions between the horse and HAI practitioners and the effect of clients on the emotional state of the horse.

Horses recognise and remember humans and will respond differently to an unfamiliar human than to a familiar one (Sankey et al. 2011). Horses gave the desired response to a signal equally often with a familiar or unfamiliar human when the human was attending the horse. However, when the human did not attend the horse after giving the signal, the horses responded obediently to the familiar human but did not respond to the unfamiliar person (ibid). Horses also chose to approach a human facing them, or looking at them whilst facing away, rather than a human who was looking away (Proops & McComb 2010).

Horses learn faster when attending the signal given (Rochais et al. 2014) and will attend the signal more often when rewarded with food rather than wither scratching (ibid). Attention may be used as a measure of horses' internal state as it has been shown that horses described as being in a "withdrawn" state showed smaller and shorter reactions to novel auditory stimuli than did non-withdrawn horses (Rochais et al. 2016).

The above findings are relevant both for the training and use of horses in HAI for three reasons, a) unfamiliar humans are often present around the horse, b) training method may influence the horse's attentional state as well as emotional association with the practitioner, and c) horses used in HAI are often required to display smaller reactions to external stimuli, which is often, but not always, associated with a state of withdrawal.

1.2.3 TP 4: Regard for current emotional states

There is no doubt that our interactions with horses influence their behaviour and their internal, affective state (Hall et al. 2018). Human stress can instigate the onset off stress in the horse, measured through increased heart rate (HR) in both human and horse (Keeling et al. 2009). Stressful working conditions may decrease the horse's overall well-being and induce higher counts of abnormal, repetitive (stereotypic) behaviours (Hausberger et al. 2009). It is also known that the states of fear and stress are detrimental to training (Valenchon et al. 2017). However, Merkies et al. (2014b) found that horses' HRs decreases in the presence of both a physiologically and a psychologically stressed human. Similar results have been seen where horses displayed lower HR in the presence of a human diagnosed with post-traumatic stress disorder (**PTSD**) (Merkies et al. 2018). In the same study, horses' HRs increased in the presence of a human who was experienced around horses and remained low when in the presence of a human unfamiliar with horses. The human HRs showed the opposite pattern (ibid). The ways in which humans can affect the state of the horse are not clear-cut but it does appear that horses are not

adversely affected by fear, stress, or PTSD in the human when nothing is asked of the horse. HR appears to increase rather when the human has a direct and purposeful body language in humans that are either familiar with horses on in the process of interacting with a horse (Keeling et al. 2009; Merkies et al. 2014a, 2018).

Clearly, horses expect certain outcomes during their interactions with humans and how it is vital that we are aware of the internal state our interactions are causing in the horse. A specific affective state may be desired in the horse during training for two reasons, one, for the welfare of the horse and two, for the efficiency of the training. Both arousal and affective state will affect the efficiency of the training in term of how the horse reacts to the four quadrants of learning theory, described in section 1.4, (Starling et al. 2013). Gaining the horse's attention, will allow the horse to learn faster because the human, and the signals given, will be more salient than other stimuli in the environment (Christensen et al. 2012). A calm affective state and a "willingness to try new behaviours" (McGreevy, 2018) is also essential during training for the best outcomes. Punishment as such will deter horses from the willingness to try new behaviours, may induce learned helplessness, and is detrimental for training purposes and positive (McGreevy & McLean 2009).

Having a calm, attentive horse with a willingness to try new behaviours will surely induce a fast learning in the horse. However, we also desire a positive affective state in the horse, Inducing the following states has been suggested for enhancing horse welfare, positive anticipation, positive contrast and coping and controllability (Boissy et al. 2007). Positive anticipation involves the expectation of a positive outcome and the affective state associated with it while a positive contrast involves a higher reward than expected, leading to a more enthusiastic performance of the behaviour leading up to the reward (ibid). Both these emotional states are regulated by the release of dopamine and are powerful at increasing the horses motivational state. They should be used with care, as dopamine is also involved in the rise of addictive behaviours and when overstimulated the horse may become frantic or frustrated as a results of losing the reward. Food rewards are also associated with nipping and biting in the horse. The third state suggested above is coping and controllability. While coping involves the reduction of stress and is undesirable as a goal, controllability involves the horse's ability to predict, affect and control the environment. This may be an aspect worth incorporating into horse training as a means of increasing the horse's autonomy and well-being. Controllability is relevant during both operant conditioning training and desensitisation (both covered in section 1.4).

1.3 Learning principles

TP5-10 in the ISES list (Figure 1), regard the correct application of learning theory, in regard to horses. They are described in more detail and discussed with regard to the scientific background.

1.3.1 TP 5: Correct use of habituation, desensitization, and calming methods

> *"Inactivity displayed by an animal may be caused by two emotional states: total equilibrium, when everything is at or close to optimum, or learned helplessness, if the subject has the experience that there is no possibility to escape the negative environment."*
>
> (Alloy & Seligman 1979)

Habituation and *sensitisation* are both forms of non-associative learning occurring in all animals and researched largely in the sea slug of the genus *Aplysia* (Brunelli et al. 1976) and the fruit fly of the genus *Drosophila* (Corfas & Dudai 1989). For the purpose of this study, habituation is in focus. Habituation is "the gradual decrease of a motor response to a stimuli that is not caused by adaptation of the sensory receptors or by motor fatigue" (Schmid et al. 2015). *Systematic* d*esensitisation* originated in human psychiatry as the applied technique of gradually introducing the phobia-inducing stimulus in small steps, in order to achieve habituation (Rachman 1967). It is often used in combination with counter conditioning in both humans (Davison 1968) and dogs (Rogerson 1997; Butler et al. 2011) where mild forms of the aversive stimuli are paired with a positive or a relaxation behaviour, so as to outcompete the anxiety response. The purpose is to ensure that the horses emotional threshold is not overreached, and a fear response is avoided. As the fear response is self-reinforcing in horses it is best prevented by avoiding inducing it in the first place (McLean & Christensen 2017). Thus, the systematic introduction and desensitisation of an aversive stimulus is an ethically sound method of creating habituation in the horse.

Counter conditioning involves the pairing a positive stimulus, food for example, with a frightening stimulus (Miller 1996; Poggiagliolmi 2018; Keller et al. 2020). The intention is that the food will change the horse's emotional response to the frightening stimulus as it becomes associated with a pleasant outcome, rather than fear. The response stimulated by the food is incompatible to the fear response stimulated by, for example a moving white bag, as in Christensen et al. (2006). Christensen et al. (2006) did not find counter conditioning to be as effective as systematic desensitisation, although the two are often used in combination.

However, in this study the association between the frightening stimulus (moving white bag) and the positive stimulus (high-value food) was ordered so that the food was introduced before the stimulus was presented. Therefore, an association would have been made in the horse that the presence of food would lead to the introduction of the frightening stimulus, and not vice versa (Domjan 2015:73-74, 76-77). Christensen et al. (2006) also mentions that counter conditioning is used successfully in the training of police horses and should not be discounted as an effective method for altering a horse's response.

In dog training, a four-week counter conditioning training programme was only slightly effective at decreasing fear responses in dogs when visiting the vet (Stellato et al. 2019). This may have been due to poor compliance with the training programme, to some extent. However, a 100% successful study saw 98 dogs being trained to eliminate fear responses for various stimuli through the use of a systematic shaping plan based on several steps including habituation, desensitisation and finally counter conditioning (Rogerson 1997). The stages of counter conditioning were graded, and the pairing of frightening stimuli and type of reward was based on an individual scale for each dog. Also, generalisation of the learned responses was gradually increased to include other locations, successively more familiar to the location where fear was originally induced. Thus, counter conditioning appears to be an effective treatment, but its successful application appears to require both preparation (habituation and desensitisation) and successive approximations (ibid).

Overshadowing is a training method to have the horse alter its response in the presence of a frightening stimulus by the use of a stimulus more salient than the frightening stimulus, that does not produce a fear response (Domjan 2015:217-218). The salient stimulus is often a learned signal for movement, for example asking the horse to take staps forward and backwards, via the halter and lead rope. A frightening stimulus might be presenting a spray bottle and spraying the horse with it. By signalling the horse to step forward and back simultaneously to spraying with the spray bottle, the horse will respond to the signals given to take steps forward and back, rather than sideways to avoid the spray bottle. In this situation, the learned signals of forward and back will have overshadowed the flight response away from the spray bottle.

Approach conditioning is often used in combination with systematic desensitisation (McLean & Christensen 2017). It involves the process of moving the frightening stimulus farther away from the horse, whilst asking the horse to follow, if it does not do so of its own accord (ibid). The horse is stopped before catching up with the frightening stimulus, for example an umbrella. The umbrella is continually moved away from the horse and the horse is asked to approach, stop, and then catch up to the umbrella. This approach utilises the horses natural curiosity as well as dissociates the flight response. It ensures that the horse does not go over

threshold and produce a fear response as the approach is prevented before this can happen.

Response prevention involves preventing the horse from moving away from a frightening stimulus. The mechanism behind it is that as the horse is unable to perform the escape behaviour it is consequently not reinforced for it. Thus, it learns that there is no relief to be had and submits to exposure to the frightening stimulus (McLean & Christensen 2017). Response prevention originates from human psychiatric treatment methods (Foa & Goldstein 1978) and has been studied in rats (Baum 1969), although not in horses as it is considered a risk to the welfare of the horse (McLean & McGreevy 2010). The risk, even with successful training, is that the horse is demonstrating learned helplessness (Hall et al. 2008).

Polyvagal theory was developed by Stephen Porges, for a detailed account see Chapter 4 in Porges and Dana (2018). It is a theory used successfully in human therapy and can be summed up with the phrase "the feeling of safety is the treatment." Simply put, the theory builds on the common understanding of the sympathetic and parasympathetic nervous systems. The sympathetic part of the autonomic nervous system activates mammalian bodies when in a state of defence, fear, or arousal. The parasympathetic nervous system (PNS) activates mammalian bodies when in a state of rest. Polyvagal theory goes a step deeper, looking at the vagus nerve as part of the PNS, and the two areas of activation of the vagus nerve. The system of the three nervous complexes can be demonstrated as a ladder, seen below.

The Polyvagal ladder: (Dana 2018)

1. Ventral vagal system: activation is associated with social engagement and the feeling of being safe and secure. It is 200 million years old. It involves the ventral, myelinated, vagal nerve, spreading ventrally to the organs above the diaphragm including the face, head, lungs, and heart. The myelinated vagal nerve is associated with our social engagement system with facial expressions, body language and eye contact. All mammals have a ventral vagal system.

2. Sympathetic system: The sympathetic part of the autonomic nervous system activates in when an animal is in a state of defence, fear, or arousal. It is associated with an aroused state including mobilisation, action, stress, tension, and anxiety. All vertebrates have a sympathetic nervous system.

3. Dorsal vagal system: association leads to two options, a state of collapse or the freeze response and appears as shut down or immobilisation. It is 500 million years old. All vertebrates have a dorsal vagal system.

Horses are recommended as part of polyvagal theory-based therapy to treat children involved in high conflict co-parenting cases (Bailey et al. 2020). They are put forward as optimal animals to practically demonstrate polyvagal theory in practice. The example used is that of a horse herd quietly grazing, then, startled by something they all raise their heads and run away. After a while, once the threat has been avoided, they all become calm again and resume grazing. This demonstration helps people understand what a healthy stress-reaction can look like (ibid). The question is, to what extent this is the case in horse training situations.

In order to train horses from a polyvagal theory framework, the trainer needs to demonstrate attunement to the horse. Attunement is built between two individuals through the "understanding and reciprocal interaction with another" (Yorke et al. 2008). Warwick Schiller described a method of desensitisation, or rather, engagement with, a frightening stimulus (Schiller, 2021). As the stimulus is introduced the horse's behaviour is watched. At the first sign of tension in the facial expression or body of the horse, the frightening stimulus is maintained at the same distance to the horse. Once the horse demonstrates any behaviour indicative of a release of tension, the frightening stimulus is then removed, negatively reinforcing a state of relaxation. Schiller describes that this method both causes the horse to engage with the frightening stimulus and also allows the trainer to demonstrate her/his attunement with the horse (ibid).

1.3.2 TP 6: Correct use of Operant Conditioning

Operant conditioning, first developed by Skinner in his work with pigeons (Skinner 1948), involves the alteration of behaviours via the association formed between a behaviour and the outcome of that behaviour. Operant conditioning will then lead to an increase or decrease of the behaviour based on said outcome. The traditional quadrant of learning theory is presented in Table 1 below, showing the four possible outcomes of a behaviour and their effect on the likelihood of the behaviour being repeated.

Table 1. The quadrant of operant conditioning learning theory

	Reinforcement The behaviour is more likely to be repeated	**Punishment** The behaviour is less likely to be repeated
Positive / Additive Something is added or given to the horse	Positive Reinforcement R+	Positive punishment P+
Negative / Subtractive Something is removed from the horse	Negative Reinforcement R-	Negative punishment P-

Positive (additive) reinforcement would be the addition of something pleasant, such as food or a scratch, in response to a behaviour performed by the horse. For example, the horse lowers its head and is given a treat, the horse will in future be more likely to lower its head. Positive (additive) punishment would be the addition of something unpleasant, such as a painful pressure, in response to a behaviour performed by the horse. For example, if the horse rears up and is simultaneously hit over the head, the horse will be less likely to rear up in the future. Negative (subtractive) reinforcement is the removal or subtraction of an unpleasant pressure from the horse in response to a behaviour performed by the horse. For example, if the horse starts trotting, the pressure of the legs is removed from the horses flank and the horse will be more likely to start trotting in the future in the same scenario. Negative (subtractive) punishment is the removal or subtraction of something pleasant, such as food or scratching, in response to a behaviour performed by the horse. For example, you are giving the horse scratches and it moves into you, unbalancing you. You stop scratching the horse, thereby causing the horse to be less likely to push into you in such future interactions.

Punishment of both types should be avoided. Negative punishment is rarely used intentionally as a method of training with horses but can occur, such as in the example above. Another use could be if a horse is pawing while in its box, walking away may negatively punish the behaviour. Positive punishment is however used intentionally and is often associated with pain for the horse. The use of punishment in horse training induces several undesired affects in the horse. These include reduced attempts to offer behaviours (Haag et al. 1980), learned helplessness (McGreevy & McLean 2009) and may even lead to PTSD, a terrible state for the horse in terms of welfare but also a dangerous state for the human handler as PTSD in horses can result in latent aggression (Bradshaw & Forthman 2009). Horses will also form adverse associations with the punisher (Mills 1998), and perhaps with humans in general, causing fear and avoidance behaviours (Hall et al. 2013) and an unpredictable and potentially dangerous environment for the horse.

Learned helplessness, arising from punishment of conflict behaviours such as rearing and biting, is a concern in horses used for human benefit. Bandler et al. (2000) review the different brain pathways involved in active and passive coping mechanisms in animals, mentioning specifically primates, rats, and cats. In their review, they identify that activation of the dorsolateral or lateral periaqueductal grey (**PAG)** columns results in active coping strategies while passive coping strategies are activated by the ventrolateral PAG column (ibid). Inescapable pain, of deep or superficial origin, will also active the ventrolateral PAG column (Keay & Bandler 1993). Cutaneous, and escapable, pain, on the other hand, is processed in the lateral PAG columns, resulting in active behavioural measures such as fight or flight (Bandler et al. 2000; Lumb 2002). Conflict behaviours in the horse are

active coping mechanisms and would therefore activate the same brain pathways as cutaneous pain, the lateral PAG columns. Once active coping mechanisms fail, passive coping states take over which in turn share the same brain pathways as deep visceral pain (the ventrolateral PAG column). Behaviours exhibited as passive coping mechanisms include lethargy, immobility and a lack of vigilance and lack of interest in the environment (Keay & Bandler 2001). Learned helplessness presents a welfare concern in circumstances where human use of the horse requires horses that are unreactive to external stimuli. This is the case both in riding schools, with children unfamiliar with horses, and in some HAI businesses, where of people of all ages with atypical physical or psychiatric functioning are interacting with large flight animals. As a safety measure, horses are often trained to reduce their reactions and tolerate challenging situations. The method of training is integral to whether horses learn to relax in challenging situations or whether they tolerate them by resorting to passive coping strategies.

One might consider reinforcing the behaviour instead. The most recent recommendation of application of reinforcers in horse training is the use of combined reinforcement. This involves eliciting a response from the horse using negative reinforcement and then applying a primary or secondary reinforcer. A primary reinforcer is inherently rewarding to the horse such as food or scratching. A secondary reinforcer is not inherently rewarding to the horse such as use of the word "good" or patting the horse's neck. For a secondary reinforcer to be rewarding to the horse it needs to have been associated with a primary reinforcer. The typical example of this is in clicker training where the "click" (secondary reinforcer) is associated with a food reward (primary reinforcer).

While R+ is often associated with motivation and exploratory behaviours (Innes & McBride 2008), R- has also been observed as inducing a positive, optimistic state in horses (Freymond et al. 2014). Studies comparing the use of R+ and R- indicate that they are both similarly effective, in general. It appears that several factors may influence the effectiveness and the affective state of the horse in each method. These include the task and the context in which the task is trained task (Döhne et al. 2014). It also includes the personality of the horse as well as the affective state of the horse (Valenchon et al. 2017).

1.3.3 TP 7: Correct use of Classical Conditioning

Classical conditioning was first discovered by Pavlov in with his experiment on dogs salivation when hearing a bell that had been associated with the arrival of food (Clark 2004). It involves the *association* between two stimuli, formed when they occur together in close proximity in both space and time (in contiguity). The two stimuli must consist of one stimulus to which the horse has no association (the unconditioned stimulus), and one stimulus to which the horse has either a learned association or an innate response (the conditioned stimulus) (Hall 1994).

In horse training these associations could be made between the type of tack used and the activities performed when using that tack. For example, the horse would form an association a saddle for training dressage or a soft saddle pad for therapy sessions. The horse would then come to expect the activity associated with the equipment used. Here, the activity represents the *unconditioned stimulus* and the emotion and physical sensations arising from the activity represent the *unconditioned response*. After the pairing has been made of the tack with the activity, the tack becomes the *conditioned stimulus* and the emotional and physical sensations associated with the activity are now the *conditioned response* (ibid).

This type of conditioning does not allow the horse to influence its environment, but it does give the horse the ability to predict its environment and obtain a general sense of safety (McLean, 2018). Another example of classical conditioning in horse training is the association formed between a light signal and a heavier signal. This is important because in horse training we aim to achieve communication with the horse off light signals, both for ease of applying signals but also for the welfare of the horse as exposure to heavy signals may involve unwelcome amounts of pressure and discomfort to the horse. An example of the application of classical conditioning in order to achieve a light rein aid for stopping a horse from a walk would look like this: a light signal is applied with no response from the horse, a heavier signal is then applied until the horse shows even a tendency toward slowing, after which the pressure is released immediately. This is R-, as seen in section 1.4.3 above, but here the focus is on the association between the light and the heavy pressures. Trainers may learn where the motivating pressure of the horse lies and continue to use this pressure to inspire a response, rather than beginning with a lower pressure every time and pairing the lower pressure with the motivating pressure in order to lighten the signal needed to signal to horse.

1.3.4 TP 8: Correct use of Shaping

Shaping is the process of training a behaviour in small steps or successive approximations to the goal behaviour (Peterson 2004; McLean, 2018). Each successive approximation along the way to the goal behaviour must be trained individually, with one signal for each new behaviour and until the horse shows *self-carriage* (section 1.4.6) for each behaviour before moving on to the next step in the shaping process (ibid). Shaping allows the trainer to build any behaviour out of the three basic responses a horse learns, go, stop, and turn. Even when training these, successive approximations are used from the first attempt of one step, or even a shift in weight in the desired direction, to several steps, maintenance of steps, and eventually self-carriage. A simpler version of a shaping plan is called a *training scale* (McLean, 2018). See below for an example of a training scale that could be used to teach a horse to side-pass along a pole.

Table 2. Training scale for training the horse to side-pass over a pole.

Step	Training procedure
Step 1	Start without the pole. Train the halt signal until it is light and consistent 3x in a row.
Step 2	Train the horse to turn its forequarters. Train one step first, then successively add steps as the horse responds off a light signal for the first step 3x in a row. The halt signal will come in useful here as the horse may trial moving forward instead. Be aware of using contradictory signals. Do not signal the horse to i) move the forequarters and ii) halt, at the same time (see section). Rather correct a movement forward by stepping the horse back after it has moved and ask for a sideways step of the foreleg again.
Step 3	Train the horse to yield its hindquarters. Train one step first, then successively add steps as the horse responds off a light signal for the first step 3x in a row. As in step 2, use the halt signal to move the horse back if it trials moving forward rather than to the side.
Step 4	Train one sideways step with the whole body and reinforce. Successively train several steps of side-pass after the horse responds off a light signal for the first step 3x in a row. Still train without the pole, until the horse responds consistently off a light signal for several steps of side-pass.
Step 5	Introduce the pole and allow the horse to investigate it without asking anything.
Step 6	Ask the horse to walk over the pole.
Step 7	Ask the horse to stop over the pole, aka re-train the halt, step 1.
Step 8	Repeat steps 2-4, now over the pole, until the horse responds consistently off a light signal. Only once step 8 is achieved would you alter the training location if desired.

The need for pauses in-between the different steps, the length of the pauses and number of repetitions may vary between individuals, however research around this is still not abundant and needs to be performed on horses. Still, for guidance see section 1.2.2. which covers the work of Holcomb et al. (2022), describing how that spaced-training is more effective than massed-training. During the training, watch the horse's behaviour for signs of activation of the sympathetic nervous system (stress signals) and give the horse as many pauses as necessary in order to avoid such arousal.

1.3.5 TP 9: Correct use of Signals/Cues

Timing involves the contiguity between signal, response, and result (Fraser 1992). That is, how close the three are to each other in both space and time. For the purpose of this paper and horse training in general, "timing" refers to closeness in time. More specifically, timing refers to the time between the horse initiating a correct

response and the release of the motivating pressure causing that response. Training methods observed in this study only involved the use of R- or occasionally combined reinforcement, so timing of R+ was not observed.

Poor timing can lead to confusion in the horse which is often expressed as frustration through conflict behaviours. Applying pressure with poor timing, irrespective of whether intended as punishment or R- poses a high risk of causing fear, stress or dissociation in the horse (McLean 2005). Fear responses form easily and are maintained long after other behaviours are forgotten (LeDoux 1994).

Another vital point to avoid confusion in the horse is the use of a single signal for a single behaviour. Often horses are exposed to pressures that may mean different things in different contexts. For example, rein pressure, via a bit or noseband, may mean turn, slow down, bend your neck laterally or flex at the poll. This kind of training should be avoided, and signals should be clear for the horse with only one response asked from each type of pressure applied (McLean, 2018).

1.3.6 TP 10: Regard for Self-carriage

The regard for self-carriage simply means that horses should be trained to maintain their response until the trainer signals otherwise (McLean, 2018). The response should *persist*, with the aid of a maintenance signal in the form of the riders seat moving in the rhythm and speed of the gait, or the handlers body position on the ground. This enables the trained signals to be as light as possible, eliminating potentially painful pressures or nagging. The horse is given the possibility to control its environment by self-regulating, rather than being held in a frame (ibid).

1.4 Project aim and hypotheses

As a step towards creating a better understanding of the welfare and safety of the horses and people involved in HAI, this study was designed to investigate the training of horses used in HAI operations in Sweden. The horses play a vital role in the running of the operations and so safety surrounding the horses is integral to the business. The safety of the clients depends both on the level of training of the horse and on the rapport between the practitioner and the horse. The rapport between the horse and the practitioner is vital for two reasons. Firstly, as mentioned in section 1.2.2 above, horses respond more consistently to a signal from a familiar human than an unfamiliar, especially when the familiar human’s attention is elsewhere (Sankey et al. 2011), as may be the case when attending a client during a HAI session. Secondly, the practitioner may act as a safety signal to the horse when it is exposed to unfamiliar or challenging stimuli during HAI sessions. Based on Christensen et al.'s (2008) conclusions that, as horses perceive their herd members as safety signals, familiar humans may, through classical conditioning, also form a

safety signal to the horse (McGreevy et al. 2014). This is strengthened by the fact that a familiar human will help a horse habituate to a frightening stimulus faster (Christensen 2012). So, the familiarity between horse and practitioner and their history of interactions and may influence the safety the horse experiences in the presence of the practitioner. The practitioner's ability to read the horse is also a vital safety measure, so as to avoid escalation of stress in the horse (see section 1.2.3).

As this study is an early step in exploring a scarcely researched area, the focus of this study is on observing horse-training in action as well as interviewing the practitioners regarding their training practices and perspectives.

This study aims to answer the following questions:

A1: What training methods do HAI practitioners use within Sweden and do they align with scientific research on ethology and learning principles?
A2: Do HAI practitioners understand the underlying causes and influences on horse behaviour and learning?
A3: How do HAI practitioners reflect on their applied training, and the applied training of other trainers?

The hypotheses to be tested in order to answer the aims of this study are:

H1: HAI practitioners train their horses through the application of learning principles and with consideration for equine ethology.
H2: Horse-assisted intervention practitioners describe their application of training in line with learning theory and equine ethology.
H3: There is a correlation between how the practitioners say they train and how they train their horses in practice.

2. Methods

This chapter will outline the recruitment process of participants and the structure of the visit at each HAI facility for data collection. The training exercises used to observe the training methods of the practitioners are described in detail as well as how the intra-observer reliability was established. The interview questions are briefly described (for the full interview see Appendix 1), as is the process of data analysis.

2.1 Participants and recruitment

This study included eight practitioners running HAI businesses in Sweden. At seven out of the eight businesses the operations manager was interviewed and observed training one of the horses used in the business. At one of the eight businesses an employee was observed instead. The choice of horse was given freely to the operations manager / employee. Henceforth the operations managers / employee will be termed "practitioner," in relation to practicing HAI.

Participating businesses were selected for the study using a published compilation of active HAI businesses in Sweden in 2021 (Andersson, 2021). Using the document, contact details were located by running a Google search for their websites. Businesses were emailed asking if they were willing to participate in a study on the training and welfare of horses used in HAI. The responses were all positive and encouraging as to the topic of the investigations. Participation rate was about 50%, mostly due to time constraints although some businesses had been laid off since Andersson's compilation had been published.

2.2 Structure of a study visit

Two studies were carried out simultaneously at each business, by two observers: this study on the training methods used, and another, as yet unpublished, on the welfare of the horses. Data collection was carried out in two parts, with data collected for the welfare study simultaneously to this one, by another observer. This meant that a particular structure was followed at each farm visit:

1. Arrival and introduction to the study. A personal data management form as well as a pet owner consent form were signed by the participant. The participant was informed that he/she was always free to a) withdraw from the study or b) skip an exercise or question at any time and need give no reason for it. Both observers proceeded to ask initial questions regarding the participants' background, the business, and the horses. These questions can be found in Appendix 1.
2. At all businesses the horse was brought in from the fields after we arrived. A heart rate monitor was fitted, and the horse was then allowed to eat hay for five minutes to allow for acclimatisation and standardisation of the heart rate measurements.
3. As part of the welfare study the horse was then tacked up. The tack used was either a saddle and bridle intended either for regular training or else a soft saddle pad intended for use in HAI sessions. One practitioner did not use any equipment other than a halter and so this step was missed.
4. The training exercises, detailed in section 2.1, were carried out. The practitioner could choose if the equipment was to be left on or removed prior to the start of the training exercises.
5. After the horse was taken back to the field the interview was conducted (see section 2.2).

2.3 Training exercises

The training exercises were chosen and designed by this author to be relevant to a horse used for HAI. A further criterium was to avoid behaviours that may already be well-trained in some horses but not in others, while keeping tasks relevant to HAI. Tasks were formed so as to have different levels of difficulty in terms of direction of movement, and all tasks were performed at the gait walk. Difficulty was increased through the use of novel props that are safe but uncommon to find on horse farms. The intention was for all horses to have the same starting point, although of course this is impossible to fully account for.

The training exercises were performed at the place of the practitioners choosing, on the stable yard or riding arena. The practitioner was informed that the goal of the exercises given was in no way something that had to be achieved. They were instructed to lay out the training set up just as they would if they were training on any day, with the goal as a final destination and to just work with the horse where it was today. The practitioner was instructed to inform us when he/she started each exercise and when he/she stopped each exercise. We also reminded that any exercise could be skipped at any time. The exercises given can be seen in Table 1 below. The exercises were presented in the order shown in Table 1 and easier tasks

were interspersed with more difficult tasks to avoid overwhelm in the horse and practitioner.

Table 3. Training exercises and the desensitisation exercise, in the order of performance.

Exercise	Description	Picture
Mat	A 33 by 40 cm blue plastic mat was placed on the ground. The goal was for the horse to stand on the mat with both front feet.	
Towel	A roll of kitchen paper towel was rolled out to approximately a length of 3 meters and width of 3-5 cm. The goal was for the horse to walk over the kitchen towel.	
Pole	A soft, foldable pole consisting of foam covered in blue plastic of length 250cm, width 10cm, height 6cm and weight 600g was placed on the ground. The goal was for the horse to stand over it, with its forelegs on one side and hindlegs on the other side. It was then to side pass along the pole.	
Back-up	The practitioner was asked to train the back-up with the horse until they were satisfied with the horse's response.	
Umbrella	The practitioner was given a folded red and white umbrella and was told to desensitise the horse to it. Some practitioners wanted further instructions and were then told that the goal was for the horse to be comfortable in the presence of the umbrella to the extent that they would be relaxed if someone were to ride them with the open umbrella.	

2.3.1 Data collection during training exercises

The methods and qualities with which the practitioners trained their horses were observed using an observation protocol designed by this author (Appendix 4). Following the ISES list of training principles, several qualities were measured. These will be outlined and briefly described below.

Methods of application of reinforcement and punishment

Possible methods of application of R- include via physical pressure, via the voice or other sound, via body posture, proximity, or movement, and via the movement of a tool. Physical pressure may be applied on the horse's head through the use of a halter or a bitted or bitless bridle. Physical pressure may be applied to the horse's body through via a whip or crop or via the hand or body of the practitioner.

Sound can be applied as a pressure, usually through the use of a clucking sound for forward movement, but voice commands for specific gaits or stopping may also be used, such as the use of the word "back" as a signal for the back-up.

Any use of the practitioner's body as a signal was recorded as "body posture" but included the pressure put on the horse through stepping closer to the horse, whilst holding the body in an upright posture and sometimes included raising one or both arms to increase the pressure. "Body posture" could involve the practitioner moving toward the whole horse, such as in the back-up, where their proximity was a signal for the horse to move back. Movement towards a part of the horse was also possible, such as signalling the horse to move their hindquarters over via moving closer toward to hindquarters, with an upright posture and sometimes an arm outstretched.

The movement of a tool involved applying pressure via a tool such as a whip or the end of a lead rope and moving it in the air without making physical contact with the horse. The wiggling of a lead rope while still attached to the halter is technically a combined movement and pressure signal but was categorised as a pressure signal as the horse does experience a physical stimulation whereas in the "tool use" category, no physical stimulation occurs.

Possible methods of application of R+ include physical application, via the voice or sound, or via a food reward. Physical applications of P+ include scratching the horse or patting the horse. This was a tricky situation because studies show that scratching the horse in certain places can be inherently rewarding, leading to lowered heart rate and lip twitching, indicating enjoyment. However, patting of the neck is often used as P+ as well. It is not a primary reinforcer as scratching is but may be a secondary reinforcer if it has previously been paired with a primary reinforcer. It was not possible to tell immediately during the observations whether the horse found the patting rewarding. The use of the voice, commonly via the word "good," is another secondary reinforcer. Both patting and vocalising "good" were documented as application of positive reinforcement. This is because the

application is intended as such, and the judgement call on how this was interpreted by the horse was not possible to make during these observations. Food rewards are a primary, inherent reinforcer for horses and observations included all food given during the training exercises.

Positive punishment may be applied via the same methods as negative reinforcement described above. The distinguishing feature of punishment was the order of the application. Punishment is applied after an unwanted behaviour and not as a signal or motivating pressure. In the same way, negative punishment could be applied via the routes as positive reinforcement but involved their removal, rather than application.

Pressure and timing

Pressure and timing were recorded on an adapted Likert scale ranging from 1-5 points (Bertram 2007). A Likert scale is usually used within the social sciences to measure participants agreement or disagreement with a statement. The most commonly used scale ranges from one to five and from "strongly disagree" to "strongly agree. While a 5-point Likert scale is most common, scales may range from a 3-point scale (Jacoby & Matell 1971) to a 7- or 10-point scale (Dawes 2008). While Likert scales are most often used to measure opinions, in this study they were adapted for use as a tool to measure two qualities used within horse training, pressure and timing. See section 2.1.2 below for information on intra-observer reliability using a Likert scale.

The measurement of pressure (low to high) ranged from point 1 as a lowest and point 5 as the highest application of pressure. Pressure intensity included physical, voice, body posture and movement pressures and the use of two or more simultaneously resulted in a higher pressure score. Pressure was measured exclusively via the observation of the practitioner and the behaviour of the horse could not influence the pressure score.

The measure of timing involves the measure of the delay in time between the onset of the correct response from the horse and the release of pressure by the practitioner. On the Likert scale, a measure of timing (fast to slow), ranged from point 1 as the fastest release of pressure and a point 5 as the slowest release of pressure.

Signal rate

The signal rate was measured using a finger tally counter. The sound made when clicking was too low for the practitioner to hear but just loud enough for the observer to hear. The finger tally counter was attached to the left pointer finger and pressed using the left thumb, allowing for notes of other observations to be recorded with the right hand. The tally counter was pressed each time a new signal was given. No measure was made of the length of each signal. The signal rate was then

obtained by dividing the number of signals between the number of seconds each exercise was practiced for, giving a rate of signals per second.

Contradictory and simultaneous signals

The application of contradictory signals was recorded when two or more signals for two different behaviours were applied simultaneously. This could involve, for example applying a slowing signal via halter pressure whilst simultaneously applying a pressure to the hindquarters in order to cause the hind legs to step away from the pressure.

A simultaneous signal was documented when two or more signals were applied signalling for the same behaviour. An example could be signalling the horse to back up whilst simultaneously applying both a physical pressure via the halter and another physical pressure via tapping a whip on the horse's chest or front legs.

Classical conditioning and shaping

Classical conditioning was recorded when a pressure was initially applied at a light level on the Likert scale and then gradually increased until a motivating pressure was achieved, and the horse responded. In order for classical conditioning to be recorded this was required to be repeated in all subsequent signals until the horse responded off the light pressure without the need for increasing pressure.

Shaping was recorded when the task given in the exercise was broken down into smaller steps. An example of a shaping plan is given in Table 2 above, but no requirement was made on how many steps an exercise should be broken down into in order for shaping to be recorded.

Choice and waiting for the horse

Training aspects allowing for input from the horse were also observed. The two ways in which this could be applied included giving the horse choice and waiting for the horse. Giving the horse choice simple involved letting the horse determine the speed and direction for any amount of time >1 sec. This involved voluntarily letting the horse choose and did not include flight responses from the horse. Waiting for the horse involved giving the horse time to respond to a given signal rather than increasing the pressure immediately to induce a faster response.

Method of desensitisation

The methods of desensitisation possible have been described above in section 1.3.1. Observations made during the desensitisation to the umbrella exercise include all accounts of each of the methods described above as well as any pauses observed.

Breaks were not recorded for the first four exercises as each exercise was performed until the practitioner was satisfied and the horse received a natural break while the next exercise was prepared and explained. However, pauses were

recorded during the desensitisation to the umbrella exercise. Two types of pauses were observed here. Paus type 1 involved the removal of the umbrella for five seconds or more. Paus type 2 involved the removal of the umbrella until the horse showed signs of relaxation including lowering of the head, blinking, or non-nutritive chewing.

2.3.2 Intra-observer reliability

In order to test intra-observer reliability for observations of classical and operant conditioning measures, practice runs were carried out using YouTube videos. The procedure used by Diaz-Lundahl et al. (2019) was followed, adapted to the conditions of this study. Seven YouTube clips were selected and judged using the training protocol (Appendix 4). Two weeks later the clips were re-watched, in a different order, and judged again. Links to the clips can be found in Appendix 5.

Clips featuring training of the back-up was selected for practice as the other exercises are uncommon and not found on YouTube. Several videos of how to train the back-up were located with ease, using the search terms “back up horse” and “horse training back up.” Applicable videos were then selected, the training was to be carried out as groundwork and not ridden work and should contain a section of pure training for at least 30 seconds without cuts. The sound was muted from the start so as not influence the judgement based on the story being told, or by background music. A start time was selected from the start of the exercise and the stop time was 30±5 seconds later. The clip was watched twice, once muted and once again with the sound on to determine if the voice or any sounds had been used as signals, reinforcement, or punishment.

Table 4. YouTube clips used in the intra-observer reliability test and the re-ordering of the clips in the second session.

Video number	Description	Start time (min:sec)	Stop time (min:sec)	Order of presentation in trial	
				1st session	2nd session
1	Steady horse	1:44	2:16	1	5
2	Colton Woods	3:10	3:40	2	4
3	Stable Horse Training	6:28	6:53	3	6
4	Cathie Hatrick-Anderson	5:30	6:00	4	1
5	Tao of Horsemanship	5:37	6:08	5	7
6	Art of the Horseman	4:43	5:17	6	3
7	AllHorseStuff1	1:02	1:36	7	2

2.4 The interview

The interview was conducted one-on-one, in person, occasionally with the second observer present. Due to lack of time, two interviews were concluded over the phone, although both were started in person. The interview was structured and followed a set of 16 questions (see Appendix 1). It took 1 hour ±15 minutes depending on how much the practitioner had to say. Answers were recorded ad verbatim in Swedish and results have been translated by this author.

Questions were chosen based on the aims of the study. Questions were divided up into the following sections:

1. Communication and relation
2. Understanding and application of learning theory
3. Training plans and design
4. Handling unwanted behaviours
5. Pressure and timing

The first section covers questions regarding the perspective on how HAI practitioners relate to their horses. Questions were based on categories found in (DeAraugo et al. 2014) with the addition of another category, relationship-based training. Both understanding of the terminology and understanding of the applications were covered in the second section of the interview. As practical application was observed during the training observations this allowed for a

correlation between understanding and application of training methods to be measured. The third section, training plans and design looks at how HAI practitioners plan before and during their training. Applications of learning theory were incorporated into these questions as well as how the sessions are designed in regard to the horses' emotional states. The fourth section looks at how the practitioners handle unwanted behaviours and with the aim to investigate the occurrence of punishment in training as well as unearthing practitioners reflections regarding the cause of conflict behaviours. The fifth and last section of the interview was a further investigation into the method used to measure pressure applied and timing of release during the training sessions. The participants were asked to rate both their own max pressure and timing levels and also to evaluate three 30 second video clips. The video clips were obtained from public horse training videos on YouTube showing a horse being trained to back-up (see links in appendix 2). The clips were selected to be evenly spread over the levels of pressure and timing on the Likert scale from 1-5.

2.5 Data analysis

Descriptive analysis of the data was carried out using Microsoft Excel version 2204, 2022. Statistical analysis of the data was carried out using Minitab version 21.1.1, 2022. Due to the small sample size, non-parametric tests were selected for analysis, where applicable. The statistical analyses remain weak and cannot be taken as conclusive. As an addition to the descriptive statistics, they do clarify the results and indicate areas where further study with a larger sample size could be promising.

3. Results

3.1 How to read the results

The results are presented as data collected over eight practitioners (P1-P8). Each practitioner trained one horse participating in this study, besides P1 who trained two horses. For the majority of the results, the data from both of the horses trained by P1 have been combined, as the goal is to investigate the actions of the practitioner. However, occasionally the results are presented for each horse individually and the P1 horses will appear as P1.1 and P1.2.

The results often show a histogram and are then presented as the number of practitioners where a certain procedure was observed (total eight). Results can also be presented across the exercises (Mat, Towel, Pole, Back-Up) and are then presented on a Likert scale from 1-5 (Bertram 2007). See below for a demonstration of how to read the boxplots correctly (Figure 2).

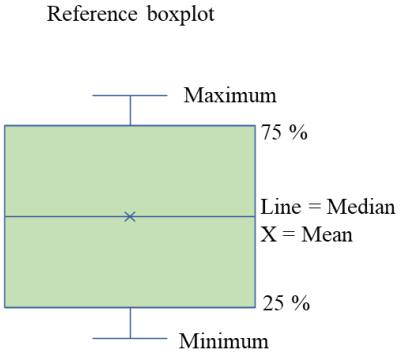


Figure 2. Reference figure showing points demonstrated on a boxplot.

3.2 Training methods

3.2.1 Pressure and timing

Pressure and timing across training exercises

The maximum pressure observed varied over practitioners and exercises (see Figure 3) and showed a tendency to differ across exercises (Kruskal-Wallis, adjusted for ties: H=7.00, P=0.07).

The maximum timing did not differ across exercises (Kruskal-Wallis, adjusted for ties: H=5.55, P=0.136). However, a difference in spread can be observed with the "Towel" exercise showing a smaller spread and lower median than the other exercises (Figure 4).

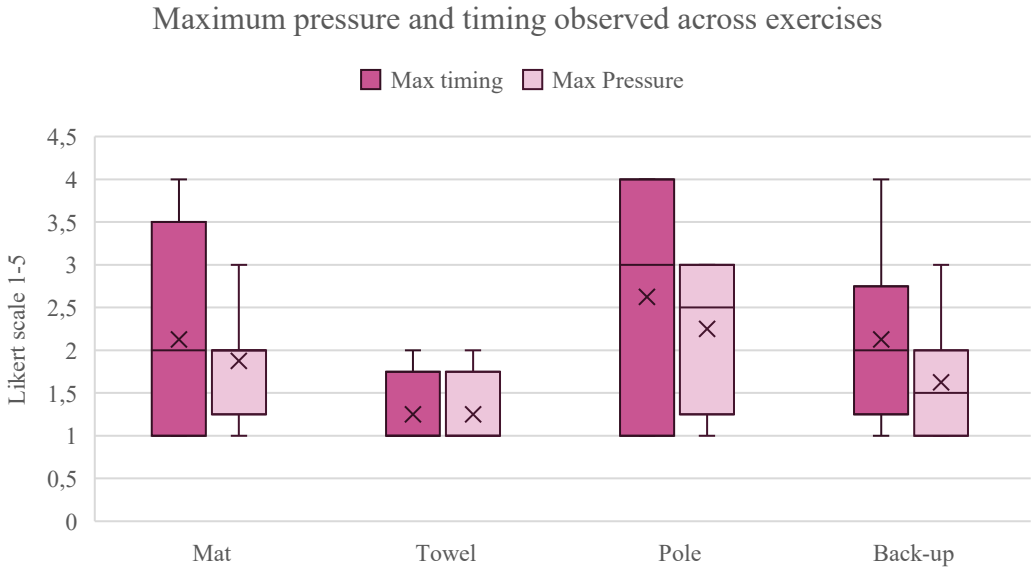


Figure 3. Maximum pressure and maximum timing (delay in release of pressure from the moment when the horse performs the desired behaviour) observed across each training exercise

The minimum pressure observed over all training exercises and practitioners, was 1, on a Likert scale of 1-5. There was one exception, where practitioner 8 (P8) used a minimum pressure of 2 in the towel exercise.

The minimum delay in the timing of release of pressure lay relatively constant across exercises with a median just above one (on a Likert scale of 1-5) for three out of four of the exercises, with an outlier of two in the "Mat" exercise. A notable increase in the spread of the timing used is seen in the "Back-up" exercise (Figure 4). However, the medians do not differ across the exercises and so no statistical test was deemed necessary.

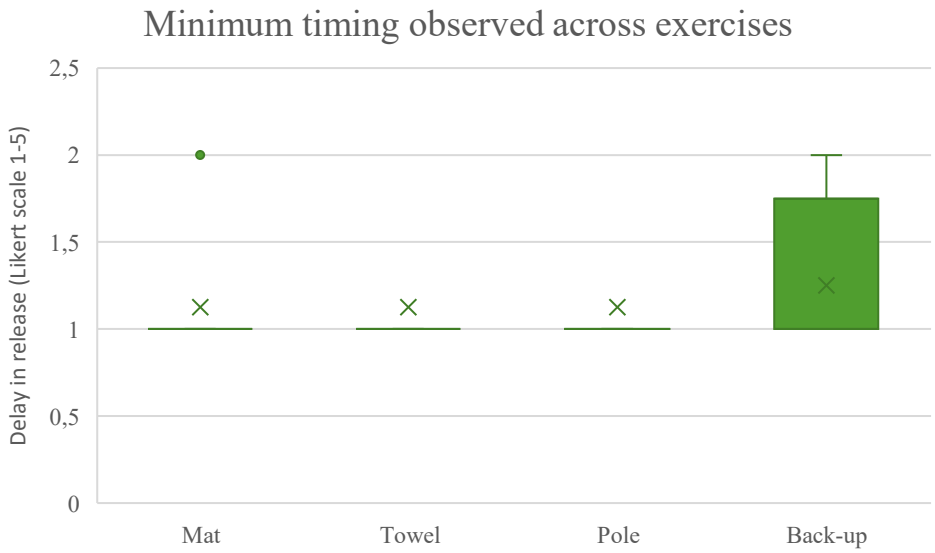


Figure 4. The max, min and IQR of the observed minimum delay in release of pressure (timing) observed across each training exercise.

Pressure and timing across practitioners

While no statistical difference can be seen in either pressure or timing across the practitioners, certain differences between, and indeed within, practitioners are apparent (Figure 5). For P1, two horses were observed with the same practitioner. A marked difference in the trainer's application of maximum pressure and timing between the two horses used by P1.

The maximum pressure applied by all practitioners ranges from 1-3 points and the maximum delay in timing ranges from 1-4 points on the Likert scale (Figure 5). The pressure used varied across 2-3 points for each practitioner. Exceptions include P1.2 for both pressure and timing and P5 for pressure where a pressure of one Likert point was observed throughout all exercises. P8 was the only practitioner to have a Likert scale point of 2 on as the lowest maximum pressure and timing observed across all exercises.

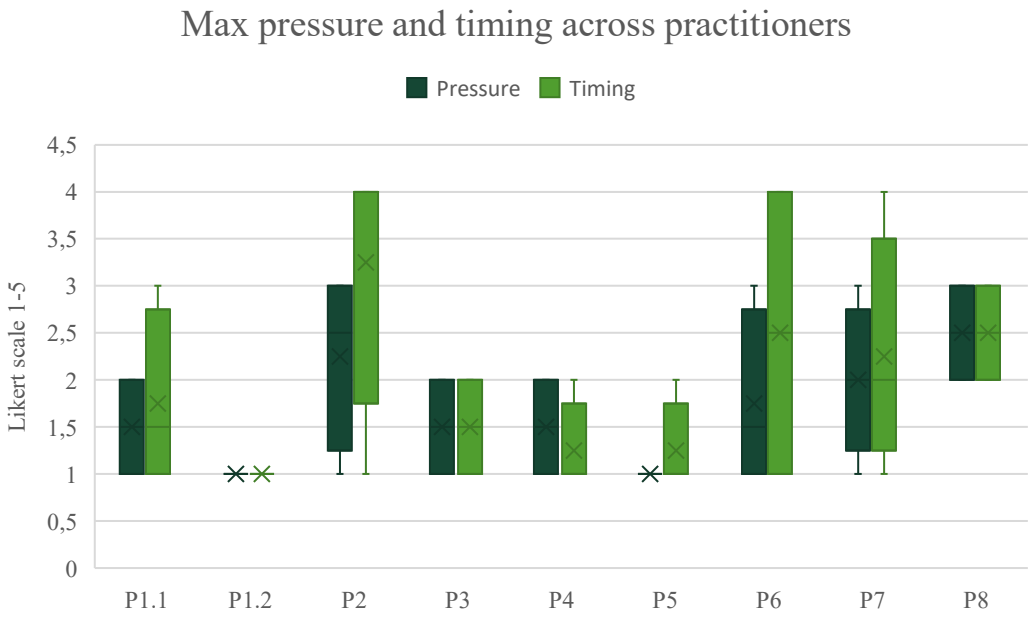


Figure 5. Maximum pressure and timing (delay in release of pressure) on a Likert scale 1-5 as measured across the practitioners. P1 produced data from two horses, depicted as P1.1 and P1.2 in the graph.

Pressure versus timing

A correlation between the maximum observed pressure and timing is observed (X^2 (6, N = 32) = 14.295, p = 0.003), demonstrated in Table 5. For the purpose of carrying out the Chi-squared test, pressure levels two and three were combined to mitigate low expected counts. Figure 5 (in the above section) also shows this correlation between pressure and timing. In only two practitioners, P2 and P6, is the difference between the means of pressure and timing used larger than 0.5 points.

Table 5. Timing (delay of release of pressure) and level of pressure exerted during training, n=32.

		Pressure	
		Low (1)	High (2-3)
Timing	1	11	3
	2	3	6
	3		3
	4		6

Self-evaluated pressure versus observed pressure

The maximum pressure independently observed agreed well with how the practitioners estimated their own maximum application of pressure. Both showed an average of 2.4, on a 1-5 Likert scale, and do not differ with more than 1 point on any practitioner (Table 6).

Table 6. Self-evaluation and observed score (on a Likert scale 1-5) of maximum pressure used across practitioners.

Practitioner	Self-evaluation	Observed score	Difference
P1	2	2	0
P2	2	3	1
P3	3	2	-1
P4	2	2	0
P5	2	1	-1
P6	3	3	0
P7	2	3	1
P8	3.5	3	-0.5
Average	2.44	2.38	-0.06

Self-evaluated timing versus observed timing

The results of the self-reported timing (delay in release of pressure) used during training and the observed average timing results do not differ. Both show an average of 2.1, on a 1-5 Likert scale, and do not differ with more than 0.5 points on any practitioner excepting P2 where a difference of two points on the Likert scale can be observed (Table 7). Here the practitioner judged their own release of pressure to be faster than that observed.

Table 7. Self-evaluation and observed score of average timing used across practitioners.

Practitioner	Self-evaluation	Observed average	Difference
P1	2	2	0
P2	1	3	2
P3	1	1.5	0.5
P4	2	1.5	-0.5
P5	2	1.5	-0.5
P6	3	2.5	-0.5
P7	3	2.5	-0.5
P8	2.5	2	-0.5
Average	2.06	2.06	0.0

Evaluation of pressure used in YouTube clips

The spread of practitioner-reported pressure values, on a 1-5 Likert scale, over three YouTube clips are shown in Figure 6. The yellow boxes represent the authors evaluation of the pressure used in each YouTube clip. For Clip 3, the yellow box is partially covering the x marking the mean score (Figure 6).

The first two clips received a range of pressure judgements lying slightly above this author's own evaluation. In the first clip, an outlier indicates that one practitioner judged the pressure in the first clip to be three points below the median of the other practitioners' judgement, and two points below this author's. The pressure judgement for the third clip shows consistent values across both practitioners and author, with one practitioner judging one Likert point lower than the rest.

Comments made while judging this task indicated that the practitioners found it challenging to judge. For Clip 1, comments indicated that the practitioners saw different kinds of pressure being applied. They saw the physical pressure and the pressure applied through movement of the body and the tool the practitioner was carrying. In these two respects, the comments made indicated that the pressure applied was low. However, the practitioners also noted the behaviour of the horse as indicative of stress, in particular the behaviour of looking away from the practitioner. This lead the majority of the practitioners to judge the level of pressure applied as high on the Likert scale.

In Clip 2, comments from some practitioners indicated that they did not understand what was occurring. One practitioner thought the procedure was "strange" and some misinterpreted the maintenance of pressure as an increase of pressure.

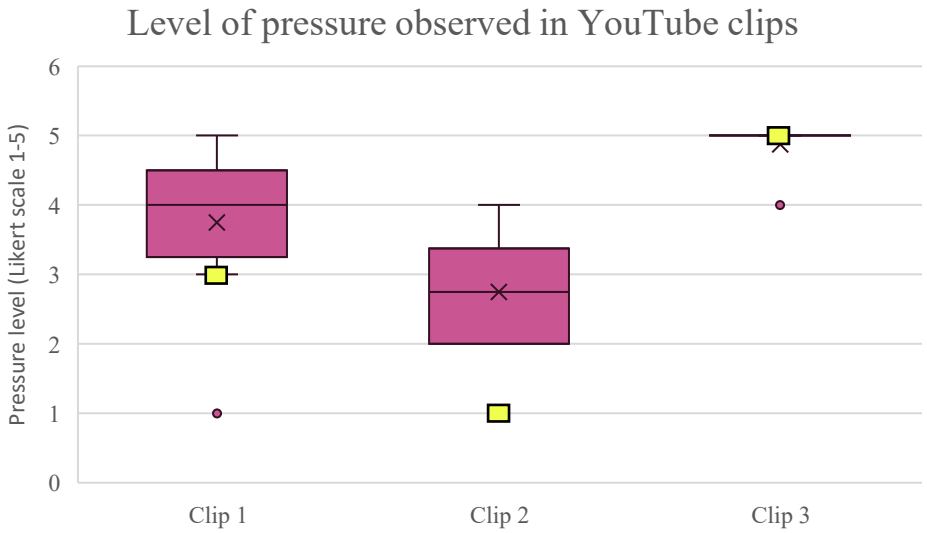


Figure 6. Level of pressure on a Likert scale from 1–5 across three YouTube clips as evaluated by HAI practitioners participating in this study.

Evaluation of timing used in YouTube clips

The spread of practitioner-reported values for timing of release in the three YouTube clips can be seen in Figure 7. The yellow box represents the author evaluated level of timing of release, for comparison. For Clip 3, the yellow box is covering the x marking the mean score.

Here, the clip with the most agreement is Clip 1, although note the outlier. The reasoning of the practitioner judging the release of pressure as 3 points slower on the Likert scale than the rest of the participants, is that the horse's behaviour throughout the clip indicated stress and avoidance of the practitioner. Therefore, although the trainer in the video clip removed some pressure, the practitioner did not believe that horse experienced a full release of pressure. As such, the video-clip trainer was judged to be slow on the release of pressure.

For Clips 1 and 3 the Median (and Mean in Clip 3) correspond with the authors own evaluation of the timing of the release of pressure. In Clip 2, the author has evaluated the timing of release to be faster than that judged by the participants. As mentioned in the results above on the pressure scores, the participants often did not see the subtle difference in application of pressure, maintenance of pressure and release of pressure in this clip. Rather, they judged the maintenance of pressure (the signal) either as an increase in pressure (as above, Figure 4) or as a delay of release (seen here in Figure 5).

While there is a high level of agreement in Clip 1 on the timing of release, Clips 2 and 3 show greater spread in evaluated timing of release. As mentioned, the judgement of Clip 2 could be hard as the changes in pressure were subtle. In Clip 3, a similar issue to Clip 1 was noted in the comments made. That is that while the pressure was released physically, "energetically" the pressure was not released throughout the clip. Also, in Clip 3, pressure was applied both in signalling the horse to back-up and in asking the horse to come forward, while the other two clips only showed a backwards pressure. The release of pressure from the forward signal was much slower than the backward signal and as such some confusion might have occurred, although no comments were made to indicate that was the case.

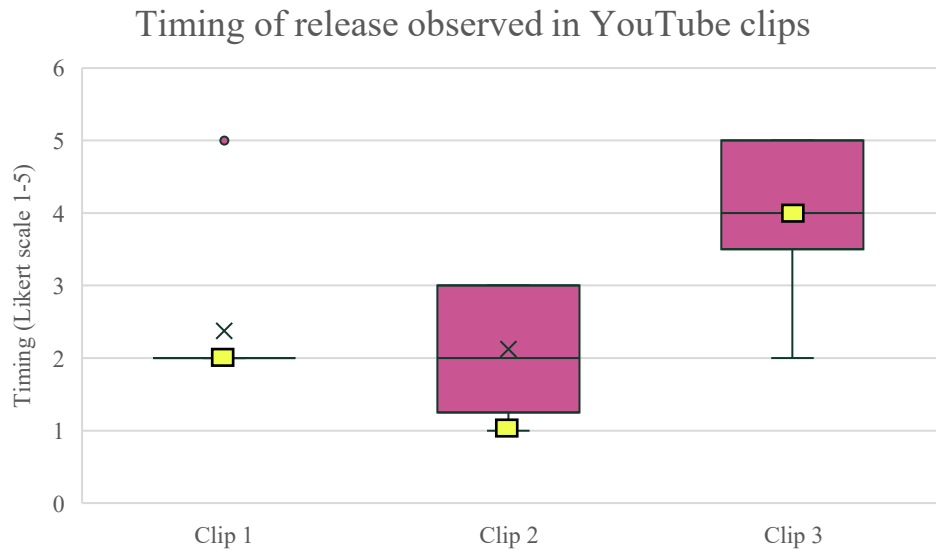


Figure 7. Timing (delay) of release of pressure on a Likert scale (1-5) across three YouTube clips, as observed by HAI practitioners participating in this study. The yellow box represents score of the authors. In Clip 3, the yellow box is covering the x marking the mean.

3.2.2 Operant conditioning

Types of reinforcement observed and reported

Of the four types of pressure application during negative reinforcement (R-), the physical application of pressure, via the hand or via a tool such as a halter, bridle, or crop, is the most common. This is true for both observed (Figure 8) and self-reported (Figure 9) application and was used at some point by all practitioners.

The use of the voice as R- was also applied by all practitioners in the Mat exercise but only by one practitioner in the Back-up exercise. In the Towel and Pole exercise it was used three and five times respectively. It is apparent that the voice is used only for certain purposes or in certain situations and is not as universally applied as communication via physical pressure.

Body movement / proximity was used in all exercises by some practitioners although most often seen in the Pole exercise (in five practitioners) and the Back-Up (in four practitioners). In the Back-Up, body movement was applied as an increase in non-physical pressure in order to maintain the back-up or in order to strengthen the physical signal to back-up. The use of tool movement was highest in the Pole and Back-up exercises as well although only seen in three and two practitioners respectively.

There was no statistical difference between the application method of negative reinforcement observed and that self-reported by the practitioners ($\chi 2(3, N=8) = 3.6$, $p = 0.3$). Three practitioners reported using “energy” or “emotions” as a form of communication. This was not measured during observations and so no comparison can be made.

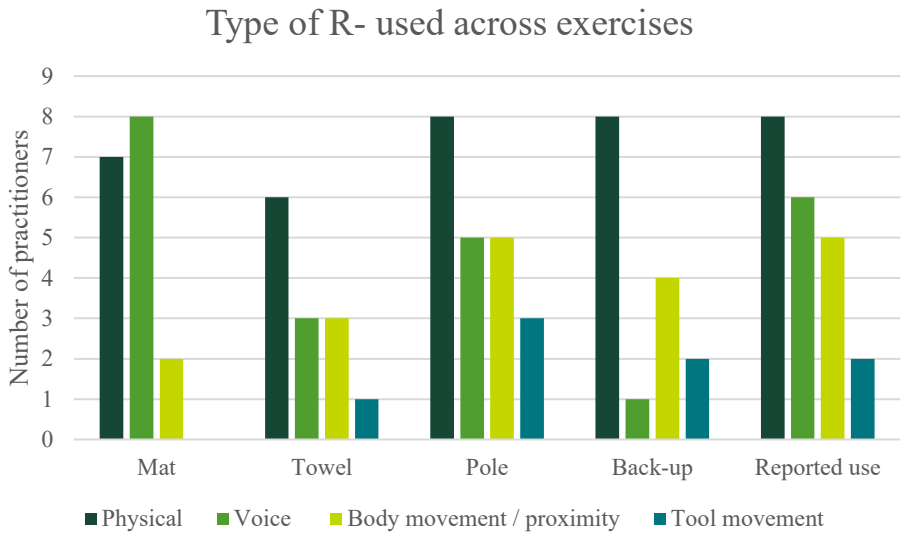


Figure 8. Observed and reported use of four methods of applying negative reinforcement across exercises.

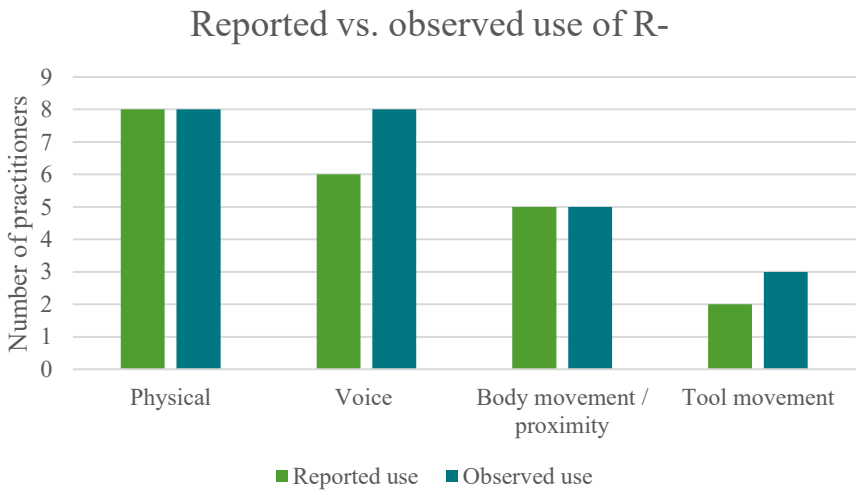


Figure 9. Observed and reported use of four methods of applying negative reinforcement.

When it comes to positive reinforcement, the use of the voice is most applied, however only by 5 out of 8 of the practitioners (Figure 10). There was no statistical difference between the application method of positive reinforcement observed and reported by the practitioners ($\chi 2(3, N=6) = 3.6$, $p=0.3$) (Figure 11). Despite this, all types of R+ were reported used more often than they were observed. This is particularly apparent for the use of food as R+ where four practitioners reported using it but did not demonstrate its use during the training exercises.

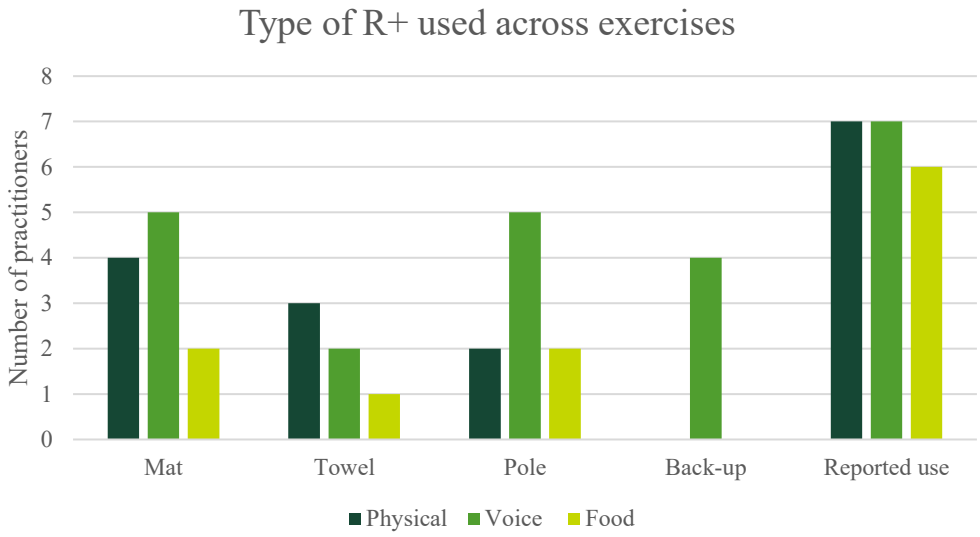


Figure 10. Observed and reported use of three methods of applying positive reinforcement across exercises.

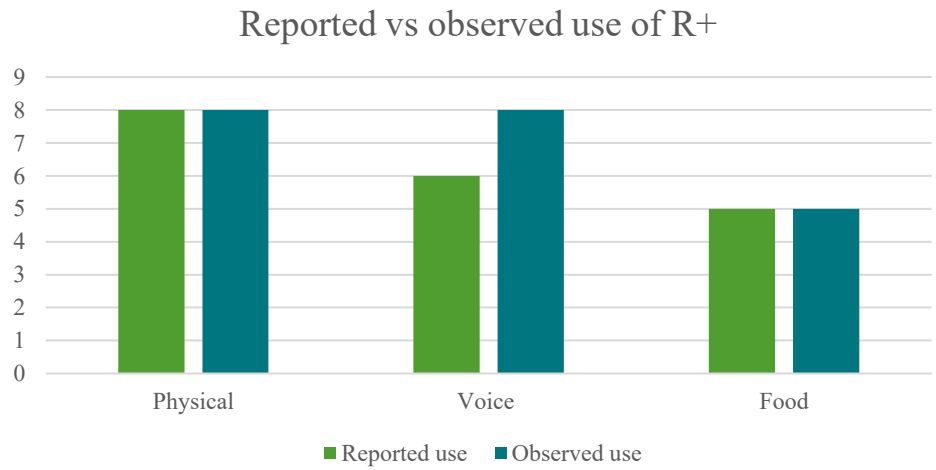


Figure 11. Observed and reported use of three methods of applying positive reinforcement.

Understanding of operant conditioning terminology

The terms "positive reinforcement, negative reinforcement, positive punishment, and negative punishment were poorly defined across the practitioners (Table 8). While the practical application as well as ability to discuss the methods used was apparent, giving definitions of these terms was challenging, with only one practitioner understanding the terms. The term "positive reinforcement" was correctly defined by most practitioners. However, when asked to define negative reinforcement attempts were made such as "if a horse is scared, I may reinforce the fear by becoming fearful myself". Similarly for positive punishment, one participant stated that "I don't use positive punishment, I would be punishing something that is going well!"

Table 8. Correct definition of operant conditioning terminology across practitioners.

	Positive reinforcement	Negative reinforcement	Positive punishment	Negative punishment
Yes	4	1	1	1
No	4	7	7	7

Signal rate

Signal rate is similar across the practitioners when all exercises are considered (Kruskal-Wallis: H (8) =9.46, P=0.305), demonstrated in Figure 12. Figure 13 demonstrates how repeated signalling of the horse occurs in backwards and sideways movements. Repeated signalling, indicated by a higher signal rate, was displayed more when asking for sideways or backward movements as opposed to forward and the forward/halt (Kruskal-Wallis: H (11) =11.01, P=0.004).

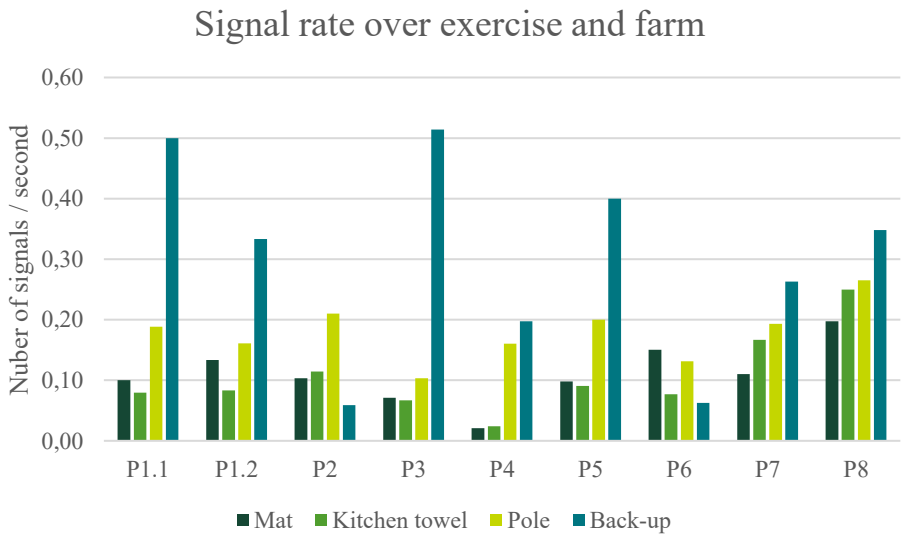


Figure 12. Signal rate over exercises and practitioners. P1 is presented twice, with two horses (P1.1 and P1.2).

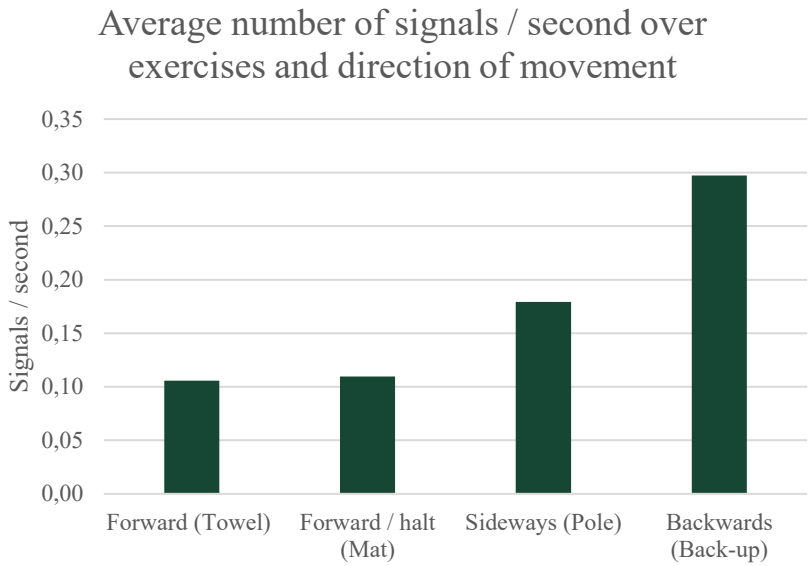


Figure 13. Average signal rate in relation to direction of movement asked of the horse.

Simultaneous signals and contradictory signals

The number of practitioners using simultaneous signals increased as more was asked from the horse in terms of direction of movement (Table 9). No practitioner used simultaneous signals in the Towel exercise, 5/8 practitioners used simultaneous signals in the Mat and Back-up exercises, and 7/8 practitioners used simultaneous signals in the Pole exercise. The data is insufficient to test for a relationship between type of signals given and signal rate. Signal rate is nonetheless shown in Table 9 for comparison.

Table 9. Number of practitioners demonstrating simultaneous signals and contradictory signals, along with signal rate, across exercises.

Exercise	Simultaneous signals	Contradictory signals	Signal rate
Mat	5	0	0.11
Towel	0	0	0.11
Pole	7	5	0.18
Back-up	5	1	0.30

Giving the horse choice and time

Giving the horse choice was recorded as "allowing the horse to choose speed and/or direction" (section 2.1.1). However, it was seen only in one circumstance during the training observations, when the horses were allowed to sniff at novel props introduced for three of the exercises. "Giving the horse choice" was observed more when the horse was required to physically interact with the prop in the Mat exercise

(Table 10). Similarly, the number of practitioners demonstrating "waiting for the horse" increased with increasing interactions with novel props.

Table 10. Number of practitioners demonstrating "gives horse choice" and "waits for horse."

Exercise	Use of prop	Interaction with prop	Gives horse choice	Waits for horse
Mat	Yes	Step on	8	6
Towel	Yes	Step over	2	3
Pole	Yes	Step over	4	6
Back-up	No	n/a	0	0

3.2.3 Classical conditioning

Classical conditioning was demonstrated by one of the eight practitioners while shaping was demonstrated by all eight practitioners (Table 11). Classical conditioning was demonstrated by one practitioner in two exercises, as through the consistent application of a light signal is used before pressure was increased. Shaping was demonstrated in several ways, dependent on exercise (Table 12).

Table 11. Number of practitioners demonstrating classical conditioning and shaping, across exercises.

Exercise	Classical conditioning	Shaping
Mat	0	4
Towel	0	0
Pole	1	8
Back-up	1	2

Table 12 describes the applications observed of shaping and classical conditioning in each exercise. Neither was used by any practitioner in the "Towel" exercise, so it is excluded. Note that the shaping procedures described consist of components observed across different practitioners and only one component was required for shaping to have been observed at each practitioner.

Table 12.Shaping procedures observed across practitioners and exercises.

Exercise	Shaping procedures observed
Mat	- Horse asked to move forward and back-up one step each in proximity of mat, then successively closer until the horse stepped on the mat. - Horse asked to put one hoof on the mat, then two hooves.
Pole	- Horse asked to walk over the pole. - Horse asked to stop over the pole. - Horse asked to move forequarter one or several steps to the right. - Horse asked to move hindquarter one or several steps to the right. - Horse asked to move whole body one step at a time to the right.
Back-up	- Horse asked to shift weight backward. - Horse asked to move one step backward. - Horse asked to move several steps backward.

3.2.4 Observed behaviours in horses over training exercises

Continuously recorded behaviours were sifted for all behaviours displayed by 2≤ horses at any time across the training exercises. They can be seen in Table 13. Data for P4 is missing.

Table 13. Selected behaviours shown across the training exercises.

Behaviour	Mat	Towel	Pole	Back-up	**Total**
Tongue outside mouth	5	1	9	1	**16**
Chewing	10	1	11	3	**25**
Ears back >5 s	4	6	12	1	**23**
Tail swish	2	0	30	1	**33**
Contact with human	13	1	13	0	**27**
Total	**34**	**9**	**75**	**6**	

A large individual variation exists within the behaviour data, several clusters of data originate from a single practitioner-horse dyad. The number and spread of displays can be seen in Table 14.

Table 14. Behaviours displayed, with abbreviations, number of horses and spread of displays.

Behaviour	Abbreviation	Number horses displaying behaviour	Mean number displays / horse	Standard deviation
Tongue outside mouth	TOM	4	6.0	2.6
Chewing	Chew	4	8.5	10.3
Ears back >5 s	EB >5s	7	4.4	3.1
Tail swish	TS	5	6.8	5.0
Shies	Shies	3	2.3	1.2
Resistance to move forward	RMF	3	2.0	1.7
Contact with human	CwH	5	5.6	5.1

3.2.5 Methods of desensitisation used

Systematic desensitisation occurred at all practitioners, and in combination with approach conditioning at 6/8 practitioners (Table 15). One occurrence of response prevention and counter conditioning each was seen at F6.

Table 15. Methods of desensitisation used across practitioners.

Practitioner	Systematic desensitisation	Approach conditioning	Response prevention	Counter conditioning
P1	Yes	Yes		
P2	Yes	Yes		
P3	Yes	Yes		
P4	Yes	Yes		
P5	Yes	Yes		
P6	Yes		Yes	Yes
P7	Yes	Yes		
P8	Yes			

3.3 Perspectives on horse-human interactions and learning

3.3.1 Relation to horse and training qualities

Relation to horse and category of training method

The practitioners' own definitions of how they relate to the horses in their HAI business demonstrate some different perspectives. These can be broadly categorised into the perception of the horses as colleagues (3/8), as friends (3/8), or as another species to be respected in its own right (2/8) (Table 16).

In terms of the category of training method practitioners identified with, all were eclectic in their choices, choosing two or more categories. Often there was a main category they identified with but had adopted thoughts and principles from other categories as well.

Table 16. Practitioners own definition of relation to horse and category of training method they identify with.

Practitioner	Own definition	Category of training method			
		Flock-leader	Behavioural science	Conventional	Relationship based
P1	Work colleagues		Yes	Yes	Yes
P2	Friends	Yes			Yes
P3	Loving	Yes			Yes
P4	Respect for another species	Yes	Yes		Yes
P5	Friends		Yes		Yes
P6	Partners / colleagues			Yes	Yes
P7	Co-workers / partners	Yes		Yes	Yes
P8	A respected other species		Yes		Yes

Self-evaluated strengths and weaknesses

A majority, 7/8 of the practitioners, reported having a calm, loving and patient attitude towards the horse during training as one of their strengths (Figure 15). The remaining four strengths were reported by only one or two practitioners. It appears that HAI practitioners place value on their internal state in their horse training, with a focus on their ability to be calm in their interactions.

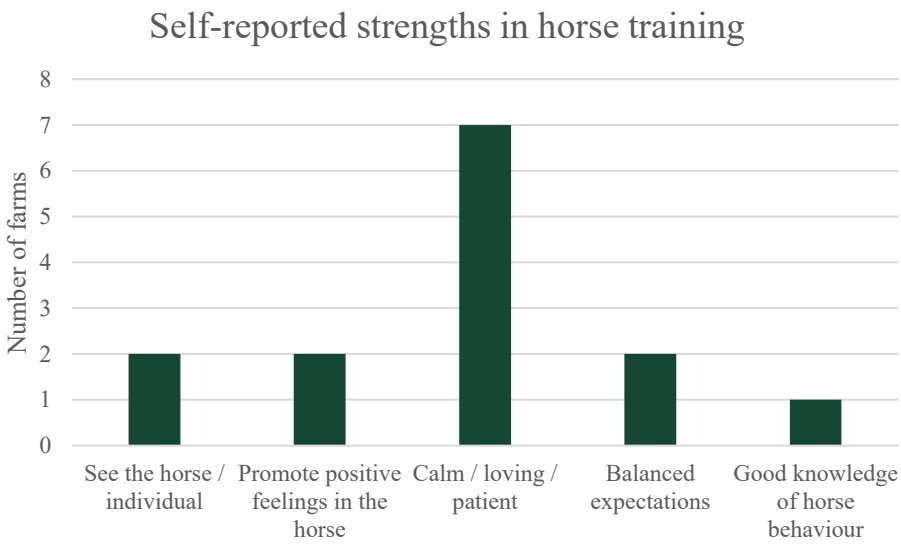


Figure 14. Self-reported strengths in horse training across practitioners.

The weaknesses reported have a greater spread across practitioners. The two most commonly reported weaknesses are a lack of confidence or endurance and an inability to maintain a training plan, reported in five and four practitioners respectively (Figure 16). Two practitioners reported lack of skills in training, and one reported a lack of emotional regularity.

The practitioner reporting that they see the individual horse as a weakness also reported it as a strength (Figure 15). The question was answered from a holistic perspective, not from an exclusively training perspective. It highlighted the benefit of training a horse by taking into consideration its "physical psychological and social capabilities". This was seen as a strength for the benefit of the horse but a weakness in terms of economical gain. However, in the larger picture this was reflected upon as a strength because only a "happy horse" can sustainably perform well. While not answering the question of training this answer did highlight the pay-off that can occur between the horse and the business.

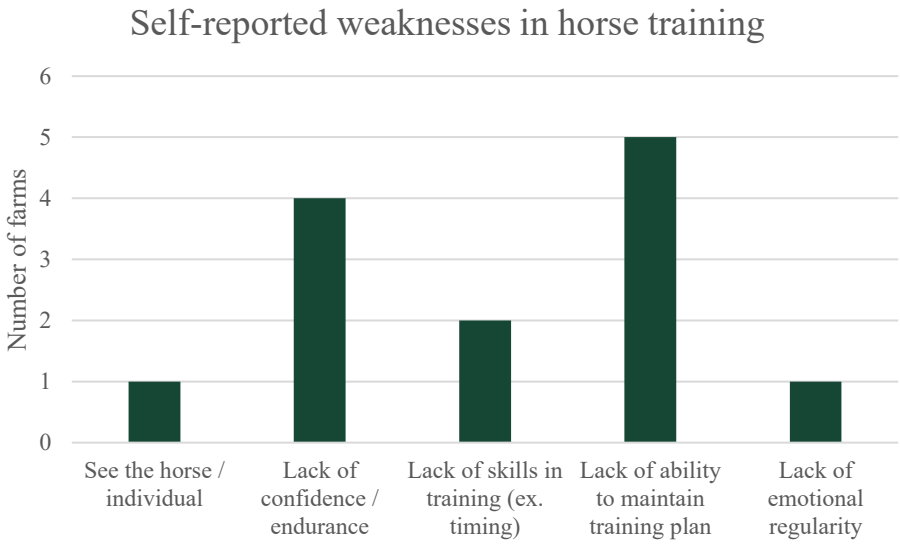


Figure 15. Self-reported weaknesses in horse training across practitioners.

3.3.2 Desired affective states during training and how to achieve them

The desired affective state of the horse during training is to be engaged, curious or interested, as expressed by 6/8 practitioners (Table 17). Half of the practitioners also reported wanting horses to feel relaxed, calm, secure or safe as well as good, positive, or happy.

Interestingly, three practitioners also expressed the wish for their horse to feel a sense of purpose or achievement through the states of being “proud” or “duktig”. “Duktig” is a Swedish word that is translated to English as “good, capable or able.” “Duktig” means rather a sense of “being good,” in a certain respect or to have a good ability in a certain area (http://www.ordlista.se/ordbok/duktig). These practitioners felt that the horse should also have a sense of achievement in their training sessions.

Table 17. Desired affective state in the horse during training.

Affective / mental state	Number of practitioners
Good / positive / happy	4
Proud / "duktig" / sense of purpose	3
Relaxed / calm / secure / safe	4
Concentrated / focused	1
Engaged / curious / interested	6
Active	1
Understand what's being asked	1

In order to achieve the desired emotional state in the horses, an emphasis is placed on making the training sessions predictable and easy for the horse (Table 18). Adapting the sessions to the horse is the most common method reported, along with short sessions and 10 other methods of creating ease within the horse. Interestingly, stimulating the horse received much less attention that creating predictability with only four mentions out of a total of 16. Variety and rewards were in focus here. It appears that value is placed most of all on an ease of understanding on behalf of the horse when shaping training sessions.

Table 18. Reported methods of adapting training sessions to the horse to promote desired affective state in the horse.

Reported consideration during training	Number of practitioners	Category	Sum of category
Adapt to horse	4	Predictable for horse	12
Clear tasks	1		
Short sessions	2		
Don't ask too much	1		
Many repetitions	1		
I am calm	1		
Successive approximations	1		
Plenty of time, to avoid stress	1		
Focus on what horse finds fun	1	Stimulating for horse	4
Reward the horse	1		
Variety	2		

The focus of the practitioners on predictability and ease of understanding may be reflected in their emphasis on the state of being “calm” during and surrounding their training sessions (Table 19). The word “calm” occurs 14 times in their descriptions of the horses’ state of being. Being in a curious state was mentioned 8 times and was also the most common desired state. The state of being “good/positive/happy” was not mentioned once, despite being a desired state by half of the practitioners (Table 17).

No negative state was mentioned significantly more than any other, all mentioned occurred only one to two times. States mentioned include impatient, suspicious, worried, tense, and bored.

Table 19. Self-reported affective state in horse before, during and after training session.

Practitioner	Prior	During	After
P1	Calm	Curious, bored	Calm
P2	Good, impatient, sour	Very "duktig", impatient	Satisfied
P3	Calm	Focused	Calm
P4	Harmonic	Calm, curious	
P5	"couldn't care less", wondering, calm	Curious, not exalted	Slightly more awake
P6	Food oriented	Very calm, curious, wondering, relaxed	Calm, starting to become antsy
P7	Curious, interested, suspicious, aware of surroundings	Generally curious, tense, wondering, worried, occasionally scared. Thought she may shut down, but she did not. Was trusting and cooperative	Quite ok, still affected by adrenaline (could be the exercises or the environment)
P8	Calm	Calm, curious, cooperative, wondering	Calm
	More tense and awake than usual, misses friends, thinks observers are strange, calm	Calm, stable, curious	Calm, thoughtful

3.3.3 Measuring progress and obstacles in training

How to judge the horse’s progress

The responses of the interviewees varied (Table 20), often depending on how they interpreted the question. Only one practitioner replied with a concrete answer regarding comparing responses between repetitions (F8). Three others mentioned moving toward a goal or the exercise going as planned, in a generalised description. One practitioner highlighted the emotional state of the horse, not answering the question but emphasising that this came first, before progress in training. Another stated that progress was less important that feeling a good communication with the

horse. One stated they did not train their horses, and another emphasised how if the training was carried out correctly then it would go well, without stating how this would then be measured.

Table 20. Interviewees responses to the question: How do you judge that the horse is learning what you are trying to teach?

Practitioner	Response
P1	Adjust the training to the horse's emotional state, so a task can take 2 years to learn if it is hard
P2	If I feel an interplay between the horse and myself, that the horse is listening to me, then I am satisfied even if the horse doesn't get where I want.
P3	If I know where I want to get, then I know if the horse is getting there. I have a picture of the goal. Then I need to be responsive and end the session in time.
P4	When I stop thinking about how it will go. Sometimes I move on too soon and then we go back. I trust that the horses will solve the situation. My wish is that the horses will become independent of us, in riding as well.
P5	That the horse performs the exercise as I planned.
P6	If I do the right thing, the horse will do the right thing. If I do something wrong, then it doesn't go so well. If I don't do the right thing, I get help because if it goes wrong the horse can be completely confused.
P7	We don't teach the horses anything. I check how the horse reacts in certain situations that it may encounter. I check if it is tense, its expression, head position, nostrils, stands still / backs-up or approaches me.
P8	It is very hard of course, to know if it is learning or if it is learned helplessness. If one repeats a task and then can see the horse responding faster to the next repetition.

Perceived obstacles to learning in horses

When answering the question of what obstacles may hinder learning in the horse, the answers were evenly divided between the internal state of the horse (13 answers, Figure 17) and the actions of the practitioner (12 answers, Figure 18). A hyperarousal of the horses emotional state was the most common deterrent of learning seen in the horse, followed by pain and then hypo-arousal. As for the actions of the practitioner, asking too much, too little or being unclear in their signals were all equally represented as possible deterrents of learning in the horse. An emotional imbalance was also mentioned by two practitioners.

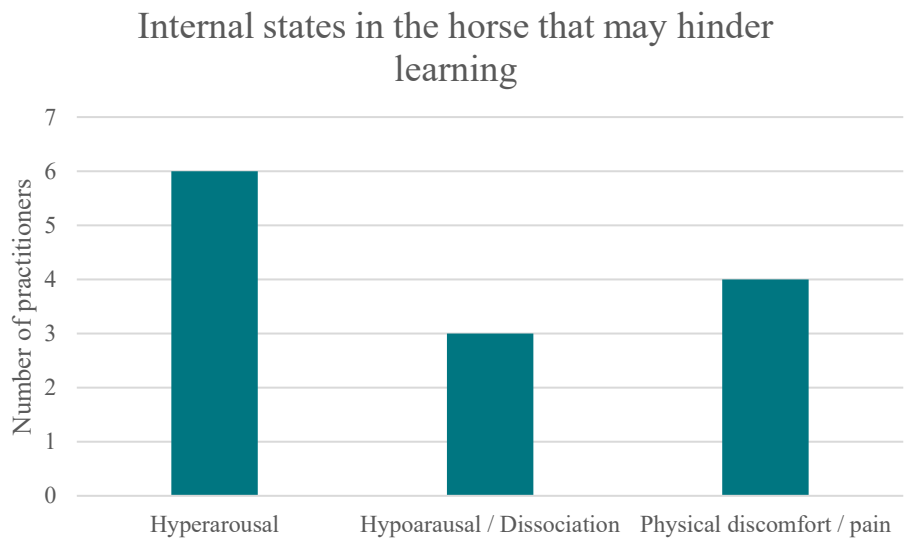


Figure 16. Practitioners responses on the internal states of the horse that may hinder learning.

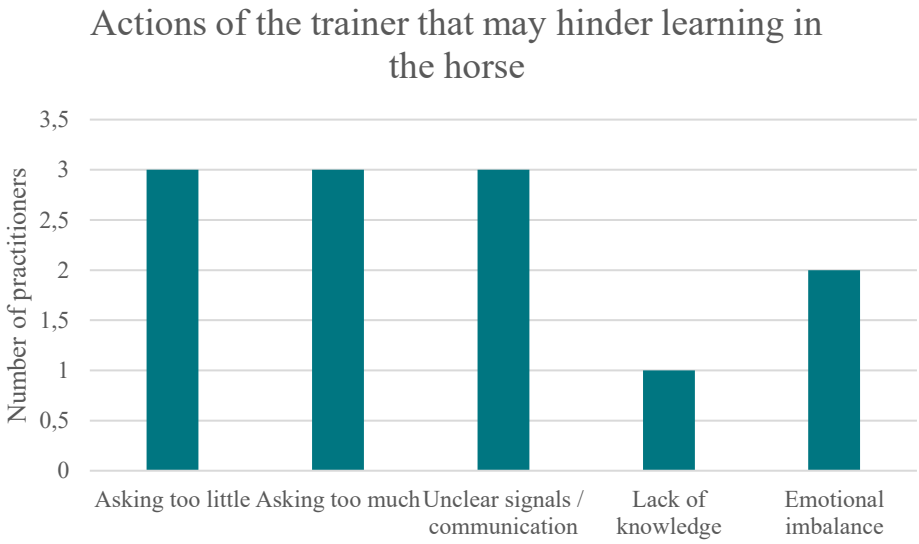


Figure 17. Practitioners responses on the actions of the practitioner that may hinder learning in the horse.

Handling undesired behaviours

The responses to how practitioners handle unwanted behaviours can be seen in Table 21 and 22. In response to how they handle a horse who does not want to go forward, three types of responses were given. One, where the practitioner uses internal energy changes as well as directional changes to motivate the horse without increasing physical pressure. Waiting for the horse was also mentioned as an option without increasing pressure. Coaxing was a term used as well as a way of asking for a forward movement without increasing pressure. Six practitioners mentioned increasing pressure, often in the sense that they had used it before or would again if no other options were available. However, three practitioners concluded that the best option would be to solve the situation through the presence of another horse, an ethologically valid solution. One practitioner mentioned that it depended on the horse how they would act. If they "knew" that the horse could walk forward and leave the herd, then they would be more likely to increase the pressure but if they "knew" that the horse would struggle they would not ask it of the horse.

In terms of responses to nipping or biting behaviours, 6/8 practitioners stated that they would ignore the behaviour. Two practitioners each would use a vocal "no", a body language "no" and a light physical prevention. One practitioner mentioned that if bitten they will hit the horse, that the horse needs to know that it is "not ok" to bite. Three practitioners interpreted the behaviour as a food-oriented behaviour while two practitioners stated that they would try to determine the reason for the nipping and adjust the situation to the horse. One practitioner expected such behaviour to occur and had a custom of warning the clients beforehand and instructing them on how to act so as to stay safe.

Table 21. Practitioners responses to the question: What do you do if a horse refuses to leave the herd, alternatively stops and won't go forward?

Practitioner	Response
P1	I need to evaluate my own impulses. I change energy level and direction. I try to minimise the flight response and the horses may stop and look at things.
P2	I wait him out, have patience, don't get stressed, then he won't walk forward.
P3	I've been through everything from losing it and trying everything, to begging. But now I will bring a friend with to avoid problems. The alternative would be to train it away and that takes time.
P4	If I know that the horse can (leave the flock) then I will be convincing. If I know that it can't then I won't do it. I tap them with the "moral stick" but don't hit them. It is different with different individuals. With one of the horses, I back-up to get where I want to go.
P5	I try to coax the horse. If they absolutely do not want to then I will release them or go back with them.

P6	Treats! Carrots. I train on it a lot. A combination of reward, and pressure, and release. Perhaps I will pull a little harder on the halter and there will be a release when the horse walks forward. But the horse needs to think it's worth leaving its flock and feel safe enough to follow me.
P7	I take some time to think. I will create pressure of some kind, either that I pull on the lead rope until the horse shows signs of wanting to move forward and then I release, or otherwise I can wave with something behind the horse. Either that someone else walks behind and waves or I can use a long whip or flag. But optimally I would have another horse with me as motivation.
P8	We have this problem with one of the horses. I have used a whip to reinforce (not hit), and I make sure that the signals are working for back and forwards. But we are more leaning towards that we actually think that we should respect the horse and realise that he does not want to leave his flock. So now we plan to have a horse with him when we bring him in so as not to ask too much of him.

Table 22. Practitioners' responses to the question: What do you do if a horse starts nipping or biting? How do you interpret the behaviour and what do you do about it?

Practitioner	Response
P1	I say "no", make sure that the horse can't reach me and ignore the behaviour. I focus on finding the reason behind and not on punishing. For example, one horse I have gets very "food happy".
P2	If they bite towards me: I know the horses and I don't make a big deal about it. I have prepared my clients so they are not standing close by when we put the saddle on because that is when we can see nipping. Information and knowledge!
P3	I think that it is a horse that is used to being hand fed with treats, that the horse is begging. I correct with by body, start by pushing them away with my arm, then use my fingers and flick them. If I am bitten I will hit back and use my voice, that is not ok.
P4	One of our horses can nip when out on a walk. It is partly a habit, partly boredom and then I will ignore it. If it is a serious bite then I think I would stop it mostly with sound and body language. It has happened that I have flicked my hand at the nose to get the horse away. A horse lunged at me when we were in the horse's box once. I had to just stand and wait her out, without reacting. I read the situation. She wasn't going into a fight, only protecting her space. It's ok for them to show how they feel, so long as they don't do it on my body.
P5	I try to think about why they acted in that way, for example it could be frustration etc. I ignore the behaviour; I want them to tell me if something is wrong.
P6	It is an expression for something. Either it's an old, learned behaviour or it is something they want to tell me. If it doesn't normally happen, then it is something it wants to tell me. I need to tell them it is not ok - it is a question of safety. It is not ok to bite or kick but they need to be able to communicate when something is not right.
P7	It depends on the situation and how I interpret it. It doesn't happen here so I'm thinking about other horses I've experienced. Nipping can be that they are begging for treats, and then I ignore it, or I indicate that they should stop with my body language, like a stop hand. One horse I ride sometimes has actually bitten me twice when he was standing eating hay and I was brushing him. When I instinctively flinched from the bite, he threw himself away from me. I think he bites because he's irritated when one brushes him in certain places.
P8	We have a horse who does this. My instinctive reaction is to tell them off, but I keep in mind that a horse that starts biting is indicating that something is wrong. I try to figure out why and adjust to the horse.

4. Discussion

The discussion section will cover how the results, in light of previous research, help answer the aims of this study. Strengths and limitations of the study will be discussed, as well as areas for future research.

4.1 A1: What training methods do HAI practitioners use and do they align with scientific research on ethology and training principles?

The hypothesis to be tested in order to answer this question was: HAI practitioners train their horses through the application of learning principles and with consideration for equine ethology. This hypothesis is addressed by the results in chapter 3.2 and this chapter will be divided into sub-sections discussing each result presented there in relation to the hypothesis and aim.

4.1.1 Applied pressure and timing

There are several considerations regarding the ethical application of signals from humans to horses. Although a logical place to start the application of pressure, it is only a small part of the picture. Besides pressure, timing of the release of pressure as well as consistency, and associations formed between signals are all vital aspects to communication through means other than words.

The results show both the lowest and highest pressure and timing used by each practitioner. Pressure and timing correlate with each other and so can be compared side-by-side, as they show similar patterns across the exercises. The results do not give any information regarding to what extent the highest and lowest pressures and timing were applied. What they do show, is that pressures used by all practitioners are as low as 1 point. The minimum timing was similarly low, at 1 point across practitioners, although a minimum timing of 2 points did occur at one practitioner. Minimum pressure and timing levels were often measured when the horse was asked to walk forward and therefore was following the practitioner. Maximum pressure levels showed a tendency to differ across exercises, the highest score was seen in the “Pole” exercise and the lowest in the “Towel” exercise. The “Towel” exercise involved only forward movement where the horse was able to follow the

practitioner over the towel and this seems to have allowed for a minimal level of both pressure and timing to be used. The Pole exercise involved both a novel prop, and an advanced sideways movement that was unlikely to have been trained previously. Here, the highest pressure and timing scores were seen.

The lowest levels of pressure and timing correlate with simple behaviours the horse is both comfortable and familiar with, following the practitioner. The horses would have been familiar with their practitioners, interacting with them on a daily basis. Familiar humans act as safety signals and decrease fear responses to novel stimuli (Christensen 2012; McGreevy et al. 2014). Therefore, it is logical that the lowest pressure observed is associated with following a familiar human over a relatively small novel object (2-5 cm in width). The highest level of both pressure and timing was observed during the Pole exercise. Here the horses were immediately asked to i) stand across a novel object and ii) perform an untrained movement directly to the side. What is interesting regarding this exercise is that the practitioners chose to increase their pressure on the horse rather than maintain a lower pressure and break the task down into smaller steps. They chose this, despite having been informed prior to commencing the exercises that the exercises were only intended as a goal, and we were not interested in whether they reached the goal or not. The practitioners were encouraged to train the horse at the level it was at. Two options exist as to the reason practitioners chose to increase pressure rather than break the task down and use a shaping plan instead. The first is that they were affected by the presence of two observers and felt pressure to perform the task set ahead of them, regardless of the instructions that completion of the task was not of interest. The second possibility is that they had no concept of shaping a complex task by breaking it down into smaller steps.

Pressure can be applied to a horse both as a signal and as motivating pressure. Horse skin is sensitive (Mills & Nankervis 2013) and the lightest of pressure can be used as a signal. It is possible to reduce rein tension by half in single session (Eisersiö et al. 2021). Pressure itself is not an intrinsic signal to horses for a change in direction or speed. The ethological, intra-specific signal for movement is communicated through body language such as “head low” and “ears back” (Ransom & Cade 2009). Naive horses show a variety of aversive reactions and avoidance learning to pressure, both applied via a bit (Christensen et al. 2011) and to leg (McLean 2005). Light signals have not been studied outright but increased pressure is associated with increased conflict behaviours (Christensen et al. 2011). Use of a “sympathetic training method” resulted in horses showing fewer conflict behaviours and lower heart-rates than conventionally trained horses (Visser et al. 2009). One aspect of “sympathetic training” was teaching horses to avoid pressure. Considering the horse’s sensitivity to tactile stimulation (Mills & Nankervis 2013), light pressures should be the goal of ethical horse training.

“The release teaches” is a phrase used to describe how important timing is in horse training. Timing is perhaps even more vital to clear communication than pressure. The timing of the release will affect both the speed of learning and conflict behaviours. Egenvall et al. (2012) studied the release of timing in the transition from trot to walk. Negative reinforcement was used via bit pressure to signal the horse to walk. One group released the bit pressure as the horse showed the first inclination to slow down while the other group released the bit pressure at the moment the horse started walking, after the slow-down was already performed. Evasion of the bit was seen more when pressure was maintained until the horse had changed gait and they recommend providing release for each step in shaping the response (ibid).

4.1.2 Signal rate

The fact that signal rate increased depending on the direction of movement indicates that HAI practitioners fail to train self-carriage in all movements. It also indicates a failure of the use of shaping. Had shaping been applied, a decreased signal rate would have been seen as a paus would have been introduced after each correct response. As it is, signals for the back-up were given repeatedly with every step in 6/8 practitioners. Possible detriments to learning as a result include i) overstimulation of the horse, ii) a lack of self-carriage, and iii) habituation to the signal.

F2 showed a prolonged signal, indicating poor timing and is reflected in the timing score for this practitioner (see section XX). F6, on the other hand, demonstrated the use of a continuation signal expressed via body position. Rather than continuously signalling in each step, this type of continuation signal allows for communication of maintenance of a behaviour. This is the basis on which self-carriage rests. Maintenance signals via body position and movement are used both in-hand and under saddle for all types of behaviours. As the human moves with the horse such maintenance signals may often be unconscious and therefore not available as a tool practitioners are cognisant of.

Besides reducing the number of signals the horse is exposed to, the benefit of training self-carriage is that the horse gains a measure of control over its environment. The ability to prevent exposure to physical discomfort (through the application of R-) is seen as a welfare benefit to horses. In conclusion, the use of TP10 is not met and training *persistence* of certain responses is lacking in HAI practitioners.

4.1.3 Application of reinforcement and punishment

The observed use of reinforcement and punishment shows varying results in relation to H1. Firstly, punishment was not observed in any practitioner. However, the use of punishment or escalating pressure was described by some practitioners as their response of choice to conflict behaviours (biting and refusing to move). No conflict behaviours were observed during the course of the training exercises and as such no observations exist for comparison. Considering the high level of concurrence between what practitioners said they did and what was observed, the results could be assumed to be reliable in regard to punishment as well. However, there may also have been a reluctance on the part of the practitioner to admit to punishment as it may be a sensitive topic. Despite knowing the results of the study would be anonymised, the expected opinion of the interviewer may have influenced these results.

This study looked at pressure applied via the voice, body proximity, and tool movement as well as physical pressure. These applications are not as common as pressure signals and do not pose as great a risk of physical misuse. It is likely, therefore that scientific research is scarce. As mentioned above (section 4.1.1), physical pressure (as applied by humans) is not an ethologically relevant application of a movement signal for the horse. Neither is sound. Sound is, however, a means of intra-specific communication, and attention in the horse can be ascertained by observing ear direction. Voice signals must be paired, through classical conditioning, with another, motivating signal.

Body movement or proximity on the other hand is an ethologically relevant means of communication for the horse. The question is whether horses can generalize our body language and movements to that of their conspecifics. Although body language is probably learned in interspecific communication as well, the case of Clever Hans (Johnson 1911) demonstrated how well horses can read minute details of human body language. Carpenter (1852), described in (Ladewig 2019), studies how a thought activates certain areas in the brain and in turn this creates a minute muscle response. It appears that horses are able to pick up on these minute muscle responses that humans may not even be aware of. It is likely that horses are adept at picking up on these minute muscle responses in other horses and that this ability has transferred to humans. This means of communication was not observed practically in this study. However, three practitioners described using “energy” or “emotions” as a means of communication with their horses. This would be an interesting area for future study.

Tool movement occurred the least of the four methods of pressure application. Tool movement is associated with natural horsemanship through the use of flags or long ropes to create a motivating pressure through movement. This is an uncommon training method in Sweden and as such it is not surprising that this is an uncommon method of pressure application. In the Pole exercise, some practitioners expressed

that they would have required a whip in order to tap the horse's hind end to ask for a yield of the hindquarters. This may even have led to an increased use of tool movement in this exercise instead of physical pressure (via whip tapping), as the lead rope was used to create a pressure toward the horse's hindquarters.

The most common application of positive reinforcement was the voice. The voice is a secondary reinforcement (McCall & Burgin 2002) and as such must be paired with a primary reinforcer in order to be effective. The effectiveness of the voice as a reinforcer was not tested so no conclusions may be drawn regarding the experienced reinforcement on behalf of the horse. It is also the easiest application of R+ as it comes naturally to us as humans to use the voice and it is able to be applied without interrupting the horse from carrying out the behaviour it is being rewarded for.

Applications of rewards were not seen to be as effective as possible. Physical rewards were not used as often as voice rewards but are likely to be more effective as they are primary reinforcers. Furthermore, physical reinforcement was often applied through the use of patting rather than scratching which, unlike scratching, is not a primary reinforcer. Voice rewards may or may not be reinforcing depending on the individual horse's learning history and whether they have been paired with a primary reinforcer. No pairing was observed during the training exercises. Food reinforcers were used at two practitioners, in-between training exercises. Other practitioners mentioned using food in other situations but not with the HAI horses due to the risk of developing nipping and nagging behaviours.

In conclusion, in terms of method of application of operant reinforcement, punishment is scarce or not used at all. This is in line with TP6 recommendations. Negative reinforcement is used almost exclusively with combined reinforcement occasionally applied. When combined reinforcement is applied the positive reinforcement was not given in association with a behaviour performed. This needs to be investigated in a future study as poor timing of food rewards may be a reason for their association with poor behaviour (nipping). As for the application of negative versus positive reinforcement, either may be applied ethically and with a sound welfare for the horse.

The methods of application of motivating pressures have not been studied much and as such little can be said regarding their validity. The methods of application of rewards used were not as effective as possible and both methods of application and timing of application (although not measured outright in this study) could be improved.

4.1.4 Simultaneous and contradictory signals

Simultaneous signals are assumed to be applied as a means to escalate a signal for which the horse was unresponsive by using a different application of pressure rather than increasing the pressure. The only exercise where no simultaneous signals were

used is the Towel exercise where the horse was walking forward, often following the practitioner. However, when the practitioner was asking the horse to move in another direction than forward, simultaneous signals were used. Five practitioners used them in the Mat and Back-Up exercise while all save one used simultaneous signals in the Pole exercise.

No practitioners used contradictory signals in the Towel or Mat exercises and only one used contradictory signals in the Back-up exercise. They would appear to be rarely used if not for the Pole exercise where five of the eight farms showed use of contradictory signals.

Different signal types applied in the Pole exercise include physical pressure, voice signals, and pressure through body proximity or movement and tool movement. Increasing the ways in which signals are given could reasonably increase the risk of sending conflicting signals. Practitioners often reported confusion after the pole exercise. Comments were made to the effect of "that was where I was more confused than the horse" and advice was sometimes asked afterwards on how to train that particular exercise. Breaking down complex tasks into small steps and following a shaping plan was not observed.

Using contradictory signals violates TP3, where the horse's cognitive abilities are overestimated. Contradictory signals lie close to punishment in terms of preventing a horse from expressing certain behaviours and risk creating confusion, conflict behaviours or, if continued, shut down and / or a lack of willingness to trial new responses. It also removes any controllability the horse may experience as it is exposed to a pressure it cannot escape via a known behaviour. As a result, TP4 is also violated due to a lack of understanding and consideration for the horses' emotional state. Contradictory signals also prevent the use of classical conditioning and shaping (see section 4.1.6). TP9 is clearly violated as contiguity between signal and response is not possible for the horse to distinguish when contradictory signals are given simultaneously.

4.1.5 Giving horse choice and time

In practice, an increase in "giving the horse choice" shows the increased propensity for the horse to be allowed to investigate the mat before being asked to stand on it. This was seen at all eight of the farms and appeared to be both the horses' own choice and encouraged by the trainers.

The quality of "waiting for the horse" involved no increase in pressure to alter speed or direction but rather giving time for the horse to respond to a signal. It follows a similar pattern over the exercises as "giving the horse choice," although less pronounced. It may be that the horse is given time because of the props used in the exercises as the Back-up is a notable exception. What can be observed is that, when introducing the horse to new objects, regard for its ethology is shown in some way across all practitioners.

As mentioned above, horse welfare is increased when the horse experiences a level of control. Inability to control aversive pressure can lead to learned helplessness (Seligman 1972; Hall et al. 2008). Even when told to perform a behaviour associated with a calm behavioural state, horses remained tense when asked to perform rather than when the posture could be freely performed: Horses forced to lower heads following external pressure were less likely to lick and chew (Warren-Smith et al. 2007).

While training does not provide choice or control for the horse, predictability and freedom of expression may mitigate the loss of control. Providing the horse with choice and time, as applied by the practitioners, was beneficial both for the horse's emotional state but also likely for the speed of learning (REFERENCE). The practitioners did uphold TP3 and 4 to some extent. However, it is possible that for optimal learning and relaxation, more time might have been necessary. A framework for identifying the needs of a horse should be developed for this purpose.

4.1.6 Classical conditioning and shaping

Classical conditioning was not seen in seven of the eight practitioners. Classical conditioning serves two purposes, i) predictability of the environment via the formation of associations and ii) associations formed between light signals and heavier signals during training, resulting in the need for light signals only. This enables a lighter pressure and a more predictable environment.

It appears that when confronted with a more complex task, the practitioners are able to break down and progressively shape the behaviour through successive approximations. However, the results of this study show only if a practitioner used shaping once in an exercise and says nothing regarding the extent to which shaping was used, or how effectively. What should be noted regarding the "Pole" exercise is that no practitioner began training the side-pass separately from the pole. All began by walking over the pole, stopping with the front and hind feet of the horse on either side, and then began to shape the sideways movement.

In conclusion, TP7 is violated as the use of classical conditioning was only observed at a single practitioner. TP8 is partially followed however only to a rudimentary degree. Improving both classical conditioning and shaping procedures has the potential to create more clarity, reduce confusion and enable lighter responses in HAI horses.

4.1.7 Behaviours observed during training

In this section the data describing the applied pressure and timing will be considered in regard to A1 (and A3). Following this, the results will be discussed in relation to TP3-4, 7-8.

Based on the behaviour data, the “Pole” exercise appeared to induce the greatest number of conflict behaviours. Notably, tail swishing is particularly prominent, but all other behaviours are commonly displayed in the Pole exercise. This includes both stress-related behaviours as well as “contact with human”. While not a conflict behaviour, it may be a comfort-seeking or questioning behaviour in seeking contact with a familiar human seen a safety signal. Either way, it indicates that the horse may have been feeling insecure, or confused, and been seeking reassurance. (find reference)

The Mat exercise also induced some displays of various behaviours. The Mat exercise involved both a new aspect (standing on the mat) and a familiar/relaxing aspect (standing still). The behaviours “tongue outside mouth”, “tail swish”, “ears back 5 sec” and “chewing” all indicate a level of stress. However, the two most displayed behaviours, “chewing” and “contact with human behaviours” appear to involve more comfort-seeking and releasing of tension than the other stress indicators.

According to these behaviour results, the most stressful exercise was the Pole, followed by the Mat, the Towel and finally the Back-up. The behavioural data seems to correspond to the exercises where conflicting signals were observed. The most farms used conflicting signals in the Pole exercise. Waiting for the horse was seen slightly more in the Mat exercise than in the Pole exercise. Finally, shaping was observed most for the Pole exercise, and then for the Mat exercise. While unlikely to be a cause of stress-related behaviours, the use of shaping indicates that the behaviour was unfamiliar to the horse.

The behavioural data must be interpreted with care. As well as indicating levels of stress they also are in direct correlation with the freedom the horse experiences to display behaviour. What is interesting is that the Towel exercise and the Back-up exercise produced a similar number of behaviours (9 and 6), significantly lower than the other two exercises. This is interesting as the Towel exercise showed the least input from the practitioner, with low pressure and timing, a low signal rate and no contradictory signals while the Back-up exercise showed the highest signal rate, and a similar number of practitioners displaying simultaneous signals to the Mat exercise. No “waiting for the horse” or “giving the horse choice” was seen in the Back-up. It was, however, only exercise without a novel prop. This is interesting as it indicates that either i) the horses weren’t allowed enough time to habituate to the props introduced but were asked to work over them too soon, resulting in stress, or ii) the horses were not given the opportunity to express behaviours during the Back-up as their behaviour was minutely controlled by the practitioner through a high number of signals. The former option would appear more likely as the behaviours observed were not directly prevented via signalling the Back-up but could easily be performed simultaneously. The Towel exercise also involved fewer instances of

giving the horse choice or time, meaning in practice that the horses were less likely to sniff the Towel, indicating that they did not perceive it as a source of potential danger, unlike the other two props. Thus, the behaviours displayed do appear to relate to the occurrence of novel props. There is another option as well, it is likely that the Back-up was the most familiar exercise for the horses. They may have felt a sense of control and safety in having the means to remove the pressure by backing up, thus controlling their environment.

In conclusion, the behavioural data align with the pattern observed in the data for giving the horse choice or time, as well as the use of shaping. While these are training aspects designed to help the horse familiarise itself and introduce clarity, they also indicate that the horse was presented with an unfamiliar task. This study measured occurrence at practitioner level and not to what extent each training aspect occurred during each exercise. It is highly likely that the practitioners allowed the horse some time at first but then assumed that one look was enough and proceeded to ask the horse to perform behaviours instead. The use of shaping has been discussed in the previous section (4.1.6) and was not either used to the extent that the horses gained clarity. It appears that more time for familiarising horses to novel objects, as well as increased shaping, would benefit the horses training and welfare.

4.1.8 Methods of desensitisation used

The results regarding method of desensitisation used to achieve habituation to the umbrella in the horses were consistent across practitioner. Systematic desensitisation was used exclusively and was combined with approach conditioning in six out of the eight practitioners. This is in line with research on ethical methods of desensitisation in dogs as well as one study in horses (Christensen et al. 2006). Systematic desensitisation, if done correctly, should induce a relaxation, that is activation of the ventral vagal system rather than the dorsal vagal system. Furthermore, through the use of approach conditioning, engagement with the frightening stimulus was encouraged as was a state of "positive anticipation." This is highly beneficial and a strong point in the HAI practitioners training. It may still be worth considering if even more social engagement can be encouraged through demonstrating attunement with the horse during the systematic desensitisation procedure, as described in section 1.3.2. All HAI practitioners stated that they used relationship-based training methods (section 3.3.1 and 4.2.2).

In conclusion, with one exception, desensitisation methods observed in HAI practitioners was ethical, positive and in line with scientific research.

4.2 A2: Do HAI practitioners understand the underlying causes of, and influences on horse behaviour and learning?

The second aim is addressed by the results in sections 3.2.2 Understanding of operant conditioning terminology, 3.3.1 Relation to horse and category of training method and 3.3.3 Perceived obstacles to learning in horses and 3.3.3 Handling undesired behaviours. This chapter will be divided into sub-sections discussing each result presented there in relation to A2, hypothesis 2 (H2) and the training principles.

4.2.1 Understanding of operant conditioning terminology

The HAI practitioners demonstrated a poor understanding of operant conditioning terminology, where only one out of eight could correctly describe all the terms. While half of the practitioners correctly identified positive reinforcement this was not seen as an understanding of the term itself but rather correct guessing as the terms "positive" and "reinforcement" were confused in the remainder of the definitions.

The poor understanding demonstrated by HAI practitioners is far from unexpected. The terminology for learning theory is often misinterpreted by professional and amateur equestrians alike (Warren-Smith & McGreevy 2008; Brown & Connor 2017). Australian coaches were tested, out of a total of 206 respondents, 11.9% correctly explained negative reinforcement and 19.3% considered it useful, whereas 78.2% considered the release of pressure useful, showing that many misinterpreted the terminology (Warren-Smith & McGreevy 2008). Positive reinforcement was correctly explained by 2.8% of coaches but 79.5% considered it very useful in training (ibid). Brown & Connor (2017) found similar results where, of 58 professional and amateur equestrians, negative reinforcement was correctly defined by 33% of professionals and only 12.5% amateurs. They also struggled with the definition of positive punishment where 38.8% professionals and 12.5% amateurs were able to provide correct a definition.

While a lack of understanding of these terms does not in itself demonstrate a lack of ability to apply operant conditioning, it may hinder perspective on what options are available and what options are currently in use. The value of a theoretical understanding of practically applied training methods must exist, if only to enable communication and discussion regarding best practice. Previous results in this study demonstrate rudimentary application of learning principles. Positive reinforcement was applied between training sessions and as such not as a reinforcer for increasing any particular behaviours. Rather, it was avoided in the HAI sector where it is associated with undesired behaviours. Also, the application of patting as a secondary reinforcer was applied. Warren-Smith & McGreevy (2008) express

concern that if reinforcement itself, along with the timing necessary to apply it correctly, is lacking, secondary reinforcers (McCall & Burgin 2002), such as patting, will have no effect.

In conclusion, education regarding the correct terminology and application of learning principles, not only the terms "positive, negative, reinforcement and punishment" but also classical conditioning, shaping and self-carriage have to potential to increase predictability of training for the horses used in HAI, and likely outside this sector as well.

4.2.2 Relation to horse and category of training method

Andersson & Sassner (2021) observed that riding school teachers describe their horses as "colleagues" while Zilcha-Mano et al. (2011) recorded that companion animals, including horses were often referred to as "friends". In this study, practitioners were equally divided between regarding horses as "friends / loving" (3/8), "work colleagues (3/8) and a "respected other species" (2/8). Expectations from the horse during training sessions may vary depending on the relationship with, and attachment style toward the horse, based on the expectancy effect (Rosenthal 1994). Expectations have also been seen to affect and learning in rats (Rosenthal & Lawson 1964) and also cat behaviour in veterinary settings based on the vets expectations and subsequent handling of the cats (Williams 2016). It is highly likely that expectations from humans affect the application of reinforcers, punishments and shaping procedures in the training of horses.

A study has looked at the type of training methods people use and noted that training methods differ depending on the attachment style of the human to their horse (DeAraugo et al. 2014). They found that participants identifying with "behavioural training" demonstrate more avoidance of horses than those who use "conspecific," "conventional," or "eclectic," training methods. Higher avoidance involves a lower emotional attachment and maintaining a cognitive detachment as well as decreased seeking of physical closeness (Zilcha-Mano et al. 2011). This is in line with the behavioural model as identifying relaxation of the horse as the handler's or rider's responsibility via the clear training of cues, rather than the horse bearing the role of providing emotional support for the rider or handler (DeAraugo et al. 2014).

While little can be concluded regarding how the relation to the horse affected training styles as no patterns could be identified between relation and training method used, future studies in this area might well unearth interesting patterns of human-horse interactions. In this study, all practitioners essentially identified as eclectic and took inspiration from 2-3 training categories. In relation to TP2, it is interesting to note that half of the practitioners at least partially subscribed to the "conspecific" model, identifying the need for the human to take on the role of the

flock leader. One subscribed to this model as well as identified as relating to horses as a "respected other species". The association between a "respected other species" and a scientific behavioural viewpoint on horses may not always be apparent. It appears that the flock leader, and thus dominance culture exists in at least some HAI practitioners. This would be an area for future research regarding the actual practical implications in training associated with the "flock-leader" perspective in an eclectic trainer.

Does this tell us anything about whether HAI practitioners understand what influences horse behaviour and learning? It tells us that there is a large variation between perspectives and relationship styles toward the horse as well as training categories subscribed to. There is a questionable influence of flock-leader and dominance mentality, and possible also a risk of anthropomorphising. Both a dominance mentality and seeing the horse as a "friend" introduces the possibility for unmet expectations. These could arise in the case of the horse failing to demonstrate "respect" or uphold a code of friendship. It could also lead to the practitioner taking on a role as a safety signal and treating the horse with the understanding they would toward a friend when faced with a challenging situation. These results open up for more questions and future research into the area of how human-horse relationships influence expectations, communication and application of training principles.

4.2.3 Perceived obstacles to learning in horses

Both internal states in the horse and actions of the practitioner were covered as potential sources of hindrance to achieving learning in the horse. Internal state in the horse, besides physical or physiological pain, included hyper-and hypo-arousal. This is in line with TP3 where avoidance of over- or under-stimulation of the horse is recommended. When responding to actions in the trainer of the horse that may hinder learning in the horse, the results were less clear in their relation to the training principles. Three out of eight practitioners identified unclear signals and asking too much of the horse as being detrimental to learning in horses. Only two practitioners mentioned a lack of knowledge and an emotional imbalance. Three mentioned "asking too little" of the horse as a causing a lack of learning. Perhaps these should have rephrased this as a "lack of skill in application of training principles" as only eight repetitions are required for a horse to learn to respond consistently to a light pressure (Eisersiö et al. 2021).

These results, in terms of states in the horse preventing learning are in line with learning principles and current research (Hall et al. 2008; Christensen et al. 2012). However, awareness of the human as the cause of i) the internal state of the horse and ii) the application of training principles seems to be lacking, in some practitioners. This was a small sample, but HAI practitioners follow a common belief in equestrians, that hyperarousal in the horse is the main cause of breakdown

of communication, with less emphasis placed on the application of communication signals as the underlying causes of learning success or failure in the horse.

4.2.4 Handling undesired behaviours

In response to actions taken regarding a horse refusing to go forward, in association with leaving the herd, practitioners would either i) use methods such as changing direction, increasing internal energy or coaxing ii) wait out the horse iii) use a conspecific to alleviate the horse's fear of leaving the herd. However, six practitioners also mentioned increasing pressure. They were averse to it and saw it as a last resort but would use it again if deemed necessary. Social isolation is a well-known fear in horses who find safety their herds. Studies have investigated social isolation either to measure stress responses in horses (Merkies et al. 2019) or in an attempt to unearth a method of stress-free habituation to teaching social separation to young horses (Hartmann et al. 2011). HAI practitioners appear to align with TP4 in that they recognise that horses unwilling to leave the herd are in an emotional state of fear. Only two out of the eight brought a conspecific with the horse to alleviate this fear, however, and other methods were used to attempt to remove the horse farther. Future studies should investigate the internal state of a horse separated from its herd.

In response to a horse demonstrating nipping or biting, the majority (6/8) HAI practitioners stated they would ignore the behaviour and the remaining two stated they would demonstrate a "no" through their body language, voice, or light physical prevention (not punishment). One practitioner expressed a difference between nipping and biting, stating that the horse would be punished for a "bite" by hitting it. Five practitioners spoke about the cause of the behaviour, two would investigate as the biting behaviours arose and three presumed it was due to food-orientated behaviours.

Punishment of unwanted behaviours, as discussed in section 1.2.4, is shown to be ineffective and unethical if improperly applied (Hockenhull & Creighton 2013). Punishment often disregards the horse's affective and physical state as underlying causes of behaviour. However, only one of the practitioners mentioned intentional punishment of biting behaviour whereas five would investigate the underlying cause instead.

In conclusion, there is a focus among HAI practitioners to identify the underlying cause of behaviours and to alleviate the cause of discomfort or fear where possible. In accordance with TP2, respect is seen for the nature of horses in at least two of the HAI farms. Company for horses during their "work" has the potential to greatly improve their social environment, sense of safety and well-being. It is, however, a large cost in terms of workforce and some businesses do not have access to additional help. TP4 is followed in that all practitioners show some regard for the horses emotional state both when fearful of social isolation and as an

underlying cause for displaying nipping or biting behaviours. The response to the emotional states is mostly understand and mitigate them, although instances of punishment for expression of emotion do still occur, in opposition to TP6. Several studies have noted that the misinterpretation of horse behaviour, on the basis of it being undesired by the handler, is one of the greatest threats to horse welfare (Hall et al. 2013; Horseman et al. 2017). The underlying affective state of the horse as causes of behaviour is something that must be brought to awareness.

4.3 A3: How do HAI practitioners reflect on their applied training, and the training of others?

The third aim is addressed by the results in sections 3.2.1 regarding the self-evaluation of pressure and timing and the evaluation of pressure and timing observed in YouTube clips. Section 3.2.2 Types of reinforcement observed and reported is also covered, as is section 3.2.4. Self-evaluated strengths and weaknesses, 4.3.4 How to judge the horse's progress in training and 4.3.6 Desired affective states during training and how to achieve them. This chapter will be divided into sub-sections discussing each result presented there in relation to the hypothesis (H3) and the aim.

4.3.1 Self-evaluation of pressure and timing

It is interesting that the self-evaluations of pressure and timing on the Likert scale corresponded so precisely with the judgement of this author. This indicates that HAI practitioners are aware of their abilities to apply pressure and timing. The Likert scale used was rudimentary with not many points to choose between and is surely a contribution to the similarities perceived in self-evaluation and external evaluation. However, this does not mean that it is not a valid measure, but rather that it is an insensitive one. While HAI practitioners theoretical abilities may be overestimated, as they fail to consider them in terms of potential hindrances in learning in the horse, their ability to apply pressure and release seems to be well-judged, as a whole.

This result is particularly interesting as previous research has found that equestrians demonstrate a Dunning-Kruger (Dunning 2011) effect in relation to their theoretical horse-related knowledge (Marlin et al. 2018), also seen in this study for on theoretical training reflections. It does not appear to exist for the practical application of pressure and release, the most common form of human-equine communication.

4.3.2 Evaluation of pressure and timing in YouTube clips

For YouTube clip 1 the pressure was judged higher by the majority of the practitioners than by this author. There was a variation of 2 Likert points between the practitioners, but the majority judged the pressure as 4 whereas this author judged it as 3. One outlier judged the pressure as 1 in the first YouTube clip. The timing judgements of YouTube clip 1 were much more homogenous with all practitioners and this author judging a fast release of timing, save one practitioner with an outlier of 5 LP for timing. This practitioner stated that the highest point was chosen as no release of pressure was seen, referring to the behaviour and "energy" of the trainer who, while removing the physical and movement pressures, failed to remove the pressure consisting of body language and energy.

The horse in this clip was performing avoidance or stress-related behaviours such as turning the head and neck away and holding the ears back throughout the clip. This was picked up on by practitioners. The horse's behaviour led them to judge the pressure as higher. In reality, during the clip, the trainer put very little physical pressure on the horse but rather more pressure through the use of body movement and proximity to the horse. As this author had pre-defined concepts of what was classified as pressure and had practiced and tested reliability of measurements, and the practitioners had had no preparation for this task, their responses demonstrated a good reading of i) horse behaviour and ii) human body language or behaviour (often interpreted as "energy" by the practitioners).

For YouTube clip 2, practitioners demonstrated a misunderstanding of the application and release of pressure and timing. The trainer in the clip slowly applied a low pressure of 1 LP, judged by this author, waited for a response in the horse, and as soon as the horse began a weight-shift in the desired direction, pressure was released (also 1 LP, judged by this author). Here, practitioners, on average, judged the pressure as almost 2 LP higher than this author, although still lower than YouTube clip 1. Timing was judged to be 1 LP higher than this author's. Misinterpretations, based on comments made by some practitioners, were due to interpreting the maintenance of pressure as i) increase of pressure or ii) a delay in release of pressure.

YouTube clip 3 showed a great pressure, judged by all, this author included as 5 LP, besides one outlier of 4 LP. The timing in this clip was more interesting and judgements varied from 2-5 LP, with a mean of 4 LP, the same as this authors. There was a release of pressure both physically, and to a lesser degree, behaviourally, in the trainer during the back-up but at the end of the clip the horse was asked to walk forward again, with very little release of pressure, some missed this part.

The clips were only 30 seconds long as no preparation was given to participants beforehand, so judgement was spontaneous and subjective. On the whole, agreement varied across the clips and across timing and pressure, one of each

received the agreement of 7/8 of the practitioners but there was always at least one outlier. Qualities in the practitioners noted were i) the ability to read horse behaviours, ii) the ability to read human body language and iii) the inability to distinguish subtle applications of pressure and release. As judgements were spontaneous and objective, basing their judgements on human body language is only to be expected. This author was more objective in judging the application of pressure through movement, proximity, and physical pressure and therefore differences arose.

There will also be a difference between horses in their experience of pressure levels and so, although highly relevant regarding the welfare of the horse, taking horse behaviour into account does not accurately measure pressure applied to the horse. Rather, different pressures will affect different horses and trainers must adapt their applications of pressure accordingly. This can be seen in the results in section 3.2.1 *Pressure and timing across practitioners,* where P1 demonstrated vastly different pressures between the two horses (P1.1 and P1.2).

In terms of the training principles, HAI practitioners demonstrate good application of TP4 in recognising the emotional state of discomfort through reading avoidance behaviours in the horse in YouTube clip 1. In regard to TP6, the application of operant conditioning via pressure and release was both recognised and misinterpreted in different clips. Interestingly there were higher levels of disagreement in judging another than in the self-reflection on pressure and timing.

4.3.3 Types of reinforcement observed and reported

Practitioners showed good self-knowledge in terms of the means of application of both positive and negative reinforcement. Observed and reported applications of pressure only differ with one farm for "tool movement" and two farms for "voice." For the application of R+, the only point on which observed and reported applications differ is the voice, observed at all farms and reported by six. It appears that the voice may be somewhat unconsciously applied. Timing in relation to application of the voice was not investigated in this study but would be a promising area for future investigation. Application of the voice as a signal for either R- or R+ is a humane method of communication and ethologically relevant to horses (Rørvang et al. 2020). Especially as it may be a means of communication allowing the horse to recognise a familiar handler even when out of sight (Lampe & Andre 2012; Proops & McComb 2012).

4.3.4 Self-evaluation strengths and weaknesses

A majority, 7/8 of the practitioners, reported having a calm, loving and patient attitude towards the horse during training as one of their strengths (Figure 13). The remaining four strengths were reported by only one or two practitioners. It appears

that HAI practitioners place value on their internal state in their horse training, with a focus on their ability to be calm in their interactions.

The self-reported strength in horse-training across 7/8 HAI practitioners, was the ability to maintain a calm, loving and patient attitude towards the horse during training. Four more qualities were mentioned by 1-2 practitioners, all relating in some way to the emotional state of the horse, directly or indirectly. The emphasis on TP4, ensuring a good emotional state in the horse is clear. Three practitioners also showed regard for TP3 by regarding horses mental and sensory abilities through "balanced expectations" and "good knowledge of horse behaviour." However, the lack of mention of any practically applied skills in behaviour modification is notable. HAI practitioners strengths lie mainly in the consideration for equine ethology and do not consist of skills in applying learning principles to the training of horses.

Reported weaknesses within training, on the other hand, produced results showing a lack of confidence or endurance in training as well as a lack of ability to maintain a training plan, a lack of training skills in five, four and two practitioners respectively. One reported a lack of emotional regularity. The weaknesses clearly show a different pattern to the strengths, emphasising applied training principles rather than the ethology and emotional state of the horse.

Considering high level of self-awareness practitioners appeared to have when evaluating their application of pressure and timing, it is likely that they too are aware of their strengths and weaknesses in training. Consideration for the horse as a being is likely to come naturally to HAI practitioners who work professionally with humans with various special needs and considerations. They are accustomed to considering the needs of others, and especially the needs of others that may be different to that of themselves. It is natural that this would extend to their relationship with their horses. Therefore, in educations designed as preparation or further education for HAI practitioners, it may be vital to emphasise the practical application of training principles.

4.3.5 How to judge the horse's training progress

Reponses to the question of how the practitioners judged progress in training showed similar results regarding the application of training principles with only 1/8 practitioners responding with a concrete answer. The remaining 7/8 practitioners produced a variety of responses, none of which mentioned differences observed between repetitions such as lightness or speed of response. The responses were rather of a general nature or emphasised the horse's emotional response. These results show, yet again, a lack of ability to discuss learning principles in HAI practitioners.

4.3.6 Desired affective states during training and how to achieve them

The most common affective state desired by practitioners (6/8) in horses during training was “engaged, curious and interested.” A state of “relax, calm, secure and safe” was reported by half the practitioners. Interestingly, when asked about what methods were used to achieve the desired states, 12 mentions of methods creating predictability and ease for the horse (in line with TP3) were mentioned, in comparison to only four mentions of methods intended to stimulate the horse. These results may not be so contradictory though, considering that in order to achieve a state of engagement and curiosity a foundation of safety and predictability is required, as mentioned in TP4 and TP5. In forming the training sessions to enable a certain affective state in the horse, the most common method, mentioned by half the practitioners, was to adapt the training to the horse. Considering that horses do respond differently to difference applications of reinforcement depending on their personality (Valenchon et al. 2017), this is a sound judgement call and in line with TP4.

4.4 Strengths and limitations of the study

The obvious limitation of this study is the low number of participants. As mentioned in the methods section, this places a limitation on what conclusions can be drawn from any statistical tests performed in relation to statistical significance but also to the validity of the results to the population as a whole. It is possible that HAI practitioners who are more successful have less time to participate in studies. It is also possible that HAI practitioners who are willing to put their time into participating in scientific studies are also more interested in learning more about horse training and welfare and will have a greater focus on learning about their horses. Participants in this study had a variety of backgrounds and trainings from both within and without Sweden. They also provided a variety of services within HAI, both physical and psychological therapy as well as HA learning and activities and do not represent any one subgroup within the HAI sector.

The use of the Likert scale for measuring pressure and timing has not been applied in this type of study previously. It is hard to validate the results further without repetition of the study or the inclusion of inter-observer reliability. However, intra-observer reliability was controlled for and also the high correspondence between observed pressure and timing with self-reported pressure and timing between this author and the practitioners further validates the Likert scale as an observation tool.

The strength of the study is that it covers new ground both in regard to the practice of training methods used withing HAI and in horse training in general. It

combines quantitative with qualitative data and provides a holistic view on horse training by incorporating measures of applied training with observed behaviours and self-reflection within participants. It identifies areas lacking in horse training in HAI practitioners, but it would appear that these are areas lacking in the equestrian population in general. It also highlights the strengths of HAI practitioners and their ability to read and adapt to the individual. Most importantly, opens doors for future research in the field of horse training through the use of new methods and new perspectives within the study of human-horse communication.

4.5 Future directions

Directions of study from this point may include further development of the Likert scale as a tool for objective assessment of training qualities such as pressure and timing. A larger Likert scale, say from 1-10 might be an improvement on the 1-5 scale, enabling more precise measurements with greater precision. A study should be done comparing the use of a 10-point Likert scale with pressure measurements or rein tension measurements to investigate the applicability of the scale. The strength of using a Likert scale is that other forms of pressure than purely physical may be included. This is perhaps less relevant when only studying the ridden horse, but there are many applications of in-hand work besides HAI where in-hand training evaluations are relevant, not least for the foundational training of young horses.

An area for future research would be in developing an educational programme covering learning principles and their practical application not only for HAI practitioners but for all equestrians. This appears to be an area sorely lacking in both education and understanding. Perhaps an alternative, lay-person's terminology could be adapted and used alongside the scientific jargon so as to avoid distancing the public. Scientific language is often exclusive by nature which inhibits the goal of research in equine science of improving the lives of horses through education of their handlers and caretakers.

Finally, an area found lacking in research is that of the optimal structure of a training session. Signal rate was measured in this study, but no research was found with which to compare it. A recent study has contributed to this area regarding the effectiveness of spaced training over massed training, and another has highlighted what can be achieved in a single session of eight repetitions. This is the area where developments should be focused in the future. Areas that should be studied include training session length, number of cues per session and optimal signal rates, and last but certainly not least, the effect of breaks on the horse's learning. The final goal would not be to determine a set number of breaks or length of breaks but rather to identify behaviours in the horse indicative of how long a break is necessary, for example. The goal of this research area would be to create a training that can be

individually applied to horses of different personalities and training histories so that training becomes a communication from horse to human as well as from human to horse.

5. Conclusion

In conclusion, the first aim of this study was to investigate what training methods are used by HAI practitioners in Sweden and whether they align with scientific research on ethology and learning principles. By observing HAI practitioners in practice and documenting training practices in accordance with the ISES training principles, it was discovered that HAI practitioners, in general, have a strong basis in aligning with TP2-4 covering the horse's ethology, mental and sensory abilities and emotional states. They are less adept at applying learning principles to training. Although pressures and timing applied were for the most part light, elements such as classical conditioning, shaping and self-carriage in the horse were lacking. These are important for the horse in terms of creating predictability and control of their environment.

The second aim was to determine whether HAI practitioners understand the underlying causes and influences on horse behaviour and learning. To answer this aim, practitioners were asked about operant conditioning terminology as well as questions on horse learning and interpretations of undesired behaviours. Their relationship towards their horses was also compared to the category of training method they identified with. The results showed an understanding amongst most practitioners regarding the horse's behaviour but less so regarding the training principles. Obstacles to learning were attributed mostly to the horses emotional state rather than to the abilities and skills of the practitioner. HAI practitioners appear highly attached to their horses and eclectic in their training methods and do not demonstrate a role of care-taking and distancing in relation to horses, as seen in those following behavioural science training methods. This would likely be counter-intuitive for those working in proximity with horses supporting humans rather than vice-versa.

The third and final aim was to investigate how HAI practitioners reflect on their applied training, and the training of others. The practitioners self-reflections regarding application of pressure and timing were accurate, as were their reflections on the types of pressures and rewards they applied in reinforcing behaviours. They varied in their judgement of reinforcement applied by others, and misinterpreted subtle pressure and release, but demonstrated consideration of horse behaviour and emotional state. Their own self-evaluations of strengths and weaknesses further highlighted their abilities to read horse behaviour and put their emotional state first.

Even the outright question regarding the judgement of the horse's progress in training was answered by the majority of practitioners in terms of the emotional state of the horse rather than learning progress.

The overall results of this study indicate that HAI practitioners are self-aware in terms of applied training and a have well-developed ability to read horse behaviour and correctly interpret it. The practical measures necessary to either mitigate behavioural problems or teach novel behaviours are less obvious as practitioners generally fail to apply, identify, and reflect on learning principles. Thus, HAI practitioners tend to have a stronger basis within ISES training principles 2-4 and less of an understanding of principles 5-10.

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Appendix 1

Interview questionnaire

Safety

1. How do you make sure that both humans and horses feel safe during training and during the **HAI** sessions?

Communication and Relation

2. How do you communicate with your horses?
3. a) What relational approach do you have toward your horses? (Partners, leader-follower etc.)
   b) Which of the following models do you subscribe to?

   Flock-leader model: Based on the flock-leader principle, as based on the horses' "natural behaviour". Often use the term "respect" when dealing with horses. Common trainers include Roberts and Parelli.

   Behaviour science model: believe that the horse only reacts to what it has learned though signals/aides that are modulated by arousal, affective states and levels of attachment. Speak of timing, conditioning and reinforcement.

   Conventional model: described as "regular Swedish sport riding" (Svensk Ridsport) as used in riding schools, by competition riders and is promoted by the Swedish Riding Federation (Svenska Ridsportförbundet).

   Relationship-based model: focus lies on reading the horses' behaviour and affective state, use of both positive and negative reinforcement but where increasing pressure is used minimally and use of time and waiting for the horse is used instead.

Learning theory and application

4. a) Do you understand what R+, R-, P+ and P- mean? Can you define them for me?
   b) Which do you use and can you give examples?
5. In what ways do you apply pressure to the horse (physical, movement, sound, proximity, food)

6. In what ways do you reward the horse (physical, sound, food)

Training plans and design

7. Do you make plans before your training of the horses? What do you take into consideration when you're designing your training sessions?
8. a) What feelings do you want your horse to have during training?

   b) How do you design your training sessions so that the horse maintains those feelings?
9. How do you determine that the horse is learning what you are teaching? And how do you judge when it is time to move on to the next step in your training?
10. Could you name three factors that can hinder the horse's learning?
11. What would you say are your strong and weak points in training horses?

Handling unwanted behaviours

12. What do you do if the horse is unwilling to leave the herd? Alternatively stops and refuses to move forward?
13. How do you reason if the horse starts nipping or biting? How do you interpret the behaviour and what do you do about it?

Pressure and timing

14. On a scale from 1-5, what is the maximum pressure you would use in your training?
15. On a scale from 1-5 how fast do you think you are at releasing the pressure?
16. I describe that they will be shown three video clips, sourced from YouTube, of horses being trained to back-up. I ask them to judge the maximum pressure used and the speed of release of pressure (timing) in these clips on a scale from 1-5.

Appendix 2

Survey of the farm, practitioner, and horse

Personal questions for the practitioner

Age:
How long is your experience with horses? Describe it briefly
Do you have an education that is relevant for the business? Briefly describe your education.
Have you furthered your education since you started working in this business? Briefly describe your further education

Farm and business

Number of horses / ponies used:
When did you start your business?
Please describe the type of services you offer here:

Horse information

Name
Age
Breed
Use
What is the horse's training history? (number of years, type, level, by who)
What personality does the horse have?
Does the horse learn fast or slow?
What are the horse's strengths?
What are the horse's weaknesses?
Do you bear anything in mind when you train this particular horse?

Appendix 3

Survey prior to the training session

Date:
Weather:
Extraneous variables:
Tack and tools:

How would you describe the horses emotional state, now, before the training session?

What emotional state was the horse in during the training session?

How would you describe the horses emotional state, now, after the training session?

How was the cooperation between you and your horse during the training session?

Appendix 4

Protocol for observations of the training exercises

Mat **Time:**

Number signals:

Type of cue / reinforcer	R-	R+	P-	P+	Notes
physical (touches body)					
voice / sound					
body posture / proximity					
movement pressure, via tool					
food					

TIMING (slow / fast)	Fast	1	2	3	4	5	Slow
PRESSURE (min / max)	Low	1	2	3	4	5	High

Contradictory signals	Y	N	2 simultaneous signals for two different responses
Simultaneous signals	Y	N	2 simultaneous signals for single response
Classical conditioning	Y	N	Correct sequencing of signals aka soft signal first
Shaping	Y	N	Uses successive approximations
Gives horse choice	Y	N	Allows horse to choose speed / direction
Waits for horse	Y	N	Uses time instead of escalating pressure

Other:

Towel **Time:**

Number signals:

Type of cue / reinforcer	**R-**	**R+**	**P-**	**P+**	**Notes:**
physical (touches body)					
voice / sound					
body posture / proximity					
movement pressure, via tool					
food					

TIMING (slow / fast)	**Fast**	**1**	**2**	**3**	**4**	**5**	**Slow**
PRESSURE (min / max)	**Low**	**1**	**2**	**3**	**4**	**5**	**High**

Contradictory signals	**Y**	**N**	**2** simultaneous signals for two different responses
Simultaneous signals	**Y**	**N**	**2** simultaneous signals for single response
Classical conditioning	**Y**	**N**	**Correct** sequencing of signals aka soft signal first
Shaping	**Y**	**N**	**Uses** successive approximations
Gives horse choice	**Y**	**N**	**Allows** horse to choose speed / direction
Waits for horse	**Y**	**N**	**Uses** time instead of escalating pressure

Other:

Pole

Time:

Number signals:

Type of cue / reinforcer	R-	R+	P-	P+	Notes:
physical (touches body)					
voice / sound					
body posture / proximity					
movement pressure, via tool					
food					

TIMING (slow / fast)	Fast	1	2	3	4	5	Slow
PRESSURE (min / max)	Low	1	2	3	4	5	High

Contradictory signals	Y	N	2 simultaneous signals for two different responses
Simultaneous signals	Y	N	2 simultaneous signals for single response
Classical conditioning	Y	N	Correct sequencing of signals aka soft signal first
Shaping	Y	N	Uses successive approximations
Gives horse choice	Y	N	Allows horse to choose speed / direction
Waits for horse	Y	N	Uses time instead of escalating pressure

Other:

Back-up

Time:

Number signals:

Type of cue / reinforcer	R-	R+	P-	P+	Notes:
physical (touches body)					
voice / sound					
body posture / proximity					
movement pressure, via tool					
food					

TIMING (slow / fast)	Fast	1	2	3	4	5	Slow
PRESSURE (min / max)	Low	1	2	3	4	5	High

Contradictory signals	Y	N	2 simultaneous signals for two different responses
Simultaneous signals	Y	N	2 simultaneous signals for single response
Classical conditioning	Y	N	Correct sequencing of signals aka soft signal first
Shaping	Y	N	Uses successive approximations
Gives horse choice	Y	N	Allows horse to choose speed / direction
Waits for horse	Y	N	Uses time instead of escalating pressure

Desensitisation to umbrella

Time

Paus1
Paus2

Systematic des.		Over shadowing		Approach conditioning	
Counter conditioning		Response prevention		Stimulus blending	
Desensitisation in acc. w. polyvagal theory					
Notes					

* paus1 = removes umbrella for ≥5 sec **paus2 = removes umbrella until the horse shows signs of relaxation

Appendix 5

Video number	YouTube account	Start min:sec	Stop min:sec	YouTube link
1	Steady horse	1:44	2:16	https://www.youtube.com/watch?v=zKoL70fxX0g
2	Colton Woods	3:10	3:40	https://www.youtube.com/watch?v=l_NqYohFAxI&t=14s
3	Stable Horse Training	6:28	6:53	https://www.youtube.com/watch?v=i1LNDGxE2Nw&t=420s
4	Cathie Hatrick-Anderson	5:30	6:00	https://www.youtube.com/watch?v=iT1V68CcEXo&t=363s
5	Tao of Horsemanship	5:37	6:08	https://www.youtube.com/watch?v=msQvijzjeIg&t=350s
6	Art of the Horseman	4:43	5:17	https://www.youtube.com/watch?v=cAVf4pUfBUY&t=533s
7	AllHorseStuff1	1:02	1:63	https://www.youtube.com/watch?v=qhP49AtUmio&t=233s

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