

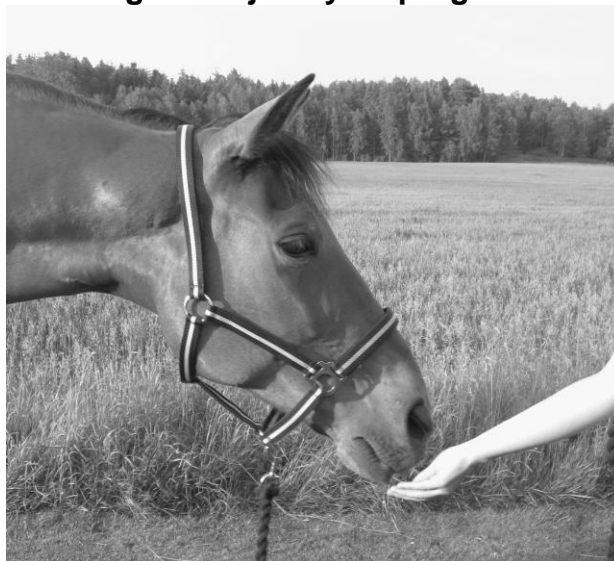


Training techniques used in training horses (*Equus Caballus*) – with a focus on positive reinforcement

*Träningsmetoder använda vid träning av häst (*Equus Caballus*) – med fokus på positiv förstärkning*

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I denna serie publiceras olika typer av studentarbeten, bl.a. examensarbeten, vanligtvis omfattande 7,5-30 hp. Studentarbeten ingår som en obligatorisk del i olika program och syftar till att under handledning ge den studerande träning i att självständigt och på ett vetenskapligt sätt lösa en uppgift. Arbetenas innehåll, resultat och slutsatser bör således bedömas mot denna bakgrund.

SUMMARY

Instrumental conditioning, the use of reinforcement and punishment, is used when training horses and these procedures may have different consequences regarding animal welfare. The aim of this study was to investigate what kind of reinforcers that are used in training horses and when these reinforcers are used. This study has its focus on positive reinforcement and its advantages and disadvantages. Interviews of five A-level and B-level equestrian coaches about their training methods were conducted to complement the literature search and give a greater understanding to why certain methods are used or not in training horses.

The results show that negative reinforcement seems to be the foundation of training horses whereas positive reinforcement is used but not to the same extent. Integrating positive reinforcement in training may enhance welfare of horses and will make the task easier and safer for the handler. The coaches that participated in this study use punishment in situations that can be unsafe, however some of the situations can be prevented by training. Secondary reinforcers are used but unsystematically. Using a secondary reinforcer, such as clicker, properly can enable the use of positive reinforcement during training of horses since wanted behaviours can be reinforced from a distance.

SAMMANFATTNING

Instrumentell betingning, användandet av förstärkningar och bestraffningar, används när hästar tränas. Dessa träningsmetoder kan ha olika konsekvens för hästarnas välfärd. Syftet med denna studie var att undersöka vilka typer av förstärkare som används i träning av hästar och när dessa förstärkare används. Studiens fokus är på användandet av positiv förstärkning och dess fördelar och nackdelar. Intervjuer med fem A-tränare och B-tränare om deras träningsmetoder genomfördes för att komplettera litteratursökningen och ge en större förståelse för varför vissa träningsmetoder används vid träning av häst och varför vissa inte används.

Resultaten visar att träning av hästar idag bygger på negativ förstärkning och att positiv förstärkning används men inte lika ofta. Användningen av positiv förstärkning kan möjligen öka välfärden hos hästar och kommer att göra träningen mer lätt och säker för tränaren. Tränare använder bestraffningar i situationer som kan bli farliga, dock skulle en del av dessa situationer skulle kunna förebyggas med träning. Sekundära förstärkare används men osystematiskt. Om man använder sekundära förstärkare såsom klicker på rätt sätt så kan man underlätta användningen av positiva förstärkare under träning eftersom önskade beteenden då kan förstärkas från ett avstånd.

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1. INTRODUCTION

1.1 Learning theory

There are several ways of training horses and all methods can be explained using learning theory. It is important to understand learning theory in order to implement training effectively (McLean, 2005). An incomplete understanding of learning theory may be substituted by an unrealistic believe of horses' understanding of training and willingness to participate (McLean, 2005) and this could affect horses negatively. Learning theory will shortly be described in the introduction of this study to get a greater understanding of training. Procedures that are important in training horses are associative learning and non-associative learning (Cooper, 1998). Non-associative learning includes habituation and sensitization. Habituation is the decrease in response to a specific stimulus that is being repeated and sensitization is the increase of a response to a specific stimulus that is being repeated (Cooper, 1998). Associative learning involves classical conditioning and instrumental conditioning. Classical conditioning is when the animal responds to a new stimulus subsequent to the new stimuli having been paired to an old stimulus (McGreevy, 2004). Instrumental conditioning is the use of aversive stimuli and pleasant stimuli presented subsequent to an animal's behaviour to alter the behaviour (Pearce, 2008), described in Table 1. This study will cover instrumental conditioning and its consequences to the horse and to training. The use of negative reinforcement, removal of aversive stimuli after wanted behavior in order to increase the frequency of that behavior, is most commonly used in training horses (Warren-Smith & McGreevy, 2008). An example of negative reinforcement in riding is when pressing the legs against the horse's sides and releasing the pressure when the horse makes a move forward. A stimulus must, from the animals' point of view be aversive in order for the removal of the stimuli to be rewarding (McGreevy, 2004). When using negative reinforcement the horse is thought to experience relief when pressure is released (Rolls, 1990). Positive punishment is also used in training horses (Warren-Smith & McGreevy, 2008) and entails the addition of an aversive stimulus following an unwanted behavior in order to decrease the frequency of that behavior (Mills, 1998). An example of positive punishment in handling horses is when the horse is being led and is walking past the trainer, the trainer stops the horse by adding pressure and thereby decreasing the frequency of the horse walking past. The emotional impacts of using positive punishment can be increased fear (Rolls, 1990). Negative punishment, the removal of pleasant stimuli after unwanted behaviour in order to decrease the frequency of that behaviour, is seldom used in horse training; this could be due to the fact that horses in the wild usually don't have resources removed as consequence of their behavior (McGreevy, 2004) and therefore this method may be less effective. When using positive reinforcement, the addition of pleasant stimuli following a wanted behavior in order to increase the frequency of the behavior, the animal is assumed to experience increased pleasure (Rolls 1990). An example of positive reinforcement in handling horses is when a horse that is to be trailer loaded takes a step towards the trailer and is immediately given a piece of carrot.

Tabel 1. Scheme of instrumental conditioning

Scheme of instrumental conditioning			
Terminology	Stimuli presentation (Skinner, 1953)	Frequency of behaviour (Skinner, 1953)	Emotionell effect (Rolls, 1990)
Positive reinforcement	Addition of pleasant stimuli following a wanted behaviour	Increasing	Pleasure
Negative reinforcement	Removal of aversive stimuli following a wanted behaviour	Increasing	Relief
Positive punishment	Addition of aversive stimuli following an unwanted behaviour	Decreasing	Fear
Negative punishment	Removal of pleasant stimuli following an unwanted behaviour	Decreasing	Frustration

1.2 Secondary and primary reinforcers

When animals are being trained using instrumental conditioning secondary and primary reinforcers are used. A primary reinforcer is an emotionally significant reward that the horse has evolved to seek, for example food (Cooper, 1998), grooming or safety from predators (McGreevy, 2004). A secondary or conditioned reinforcer is a neutral stimulus paired to a primary reinforcer (McGreevy, 2004) and can for example be vocal praises (Cooper, 1998), a buzzer (McCall & Burgin, 2002) or a clicker (Williams *et al.*, 2004; Ferguson & Rosales-Ruiz, 2001). When training horses a secondary reinforcer can be used to mark a wanted behaviour with a sound and bridge the gap from that behaviour to the primary reinforcer (McGreevy, 2004). First the secondary reinforcer must be conditioned to the primary reinforcer by for example clicking and then immediately delivering a primary reinforcer. Eventually the time between the clicker and primary reinforcer can be increased (McGreevy, 2004). The primary and secondary reinforcers are not to be delivered simultaneously since there is a risk of overshadowing. Overshadowing is the simultaneous presentation of two stimuli of different vigor with the result that the response to the weaker stimuli declines (McLean, 2008), if food for example is presented simultaneously with a secondary reinforcer the horse's response to the secondary reinforcer may decline and if delivered after the primary reinforcer the secondary reinforcer may remain neutral since it doesn't predict future rewards (McGreevy, 2004). When having taught the horse a behaviour a cue can be added and in time the horse will perform the wanted behaviour when being exposed to the cue e.g. the horse has learnt to lay down, the vocal cue "lay" is added and in time the horse responds to that cue by laying down. It is important to keep reinforcing the behaviour or it will become extinct.

1.3 Welfare concerns

Ödberg & Bouissou (1999) suggest that bad riding is an underestimated welfare problem and stress the fact that there are individual differences as to how animals react to stress. Numerous horses seem to live in a constant state of stress due to them not being able to know how to avoid punishment (Ödberg, 1987). Some horses are unwilling to be saddled and show behavioural problems when ridden (Normando *et al.*, 2002) and there is anecdotal indications that horses can experience learnt helplessness as a result of severe stress during riding and handling (Hall *et al.*, 2008; Ödberg 1987). Learnt helplessness is the experience of having no control over the outcome of a situation and act helpless even if there is a possibility to avoid discomfort or pain (Hall *et al.*, 2008). McLean (2005a) suggests that simultaneous presentation of opposing stimuli, the absence or wrong timing of release of pressure and the lack of shaping procedure (shaping means reinforcing the behaviour that is better than the previous best) can contribute to severe and unceasing stress responses in horses. Since the training of horses is based on negative reinforcement rather than positive reinforcement (Goodwin *et al.*, 2008) and since horses are not willing participants in competition as suggested by McGreevy & Murphy (2009), the horse industry needs scientific investigation to evaluate the ethical aspects of training (McGreevy & Murphy 2009 & Goodwin *et al.*, 2008)

1.4 Aim

The aim of this study is to find out what kind of reinforcers that are used in training horses and when they are used. The focus of this study will be on positive reinforcement and whether or not its use can improve the welfare of horses, if it can, then how can it be integrated to traditional training techniques? This study is a literature study combined with interviews of equestrian coaches about their training methods, this to get a greater understanding in how horses are trained today

2 METHODOLOGY

2.1.Literatur search

The scientific articles used in this study was searched for in different databases like Web of Knowledge and Scopus using the keyword “horse” combined with keywords such as; clicker, positive reinforcement, negative reinforcement, learning and secondary reinforcer. Studies on horses were always chosen before studies on other species. If there were no studies on horses articles on other species were used. The original reference was always used and the articles that were not published on the internet were sent for by mail. Three books was used, one by Skinner (1953) describing learning theory and two more recently published scientific books (McGreevy, 2004 & Pearce, 2008) covering learning theory.

2.2 Interviews

Five A-level and B-level coaches were interviewed by phone and the interviews were recorded to make sure that nothing was overlooked. The coaches for the interviews were chosen partly by recommendations from someone who knew these coaches and believed the coaches to be willing to participate and partly by randomly choosing from accredited A-level and B-level coaches on the internet. The criteria for being chosen for interview was that the coach was to be an accredited A-level or B-level coach and teach future equestrian coaches. E-mails were sent to eleven coaches of whom five agreed to participate, the main reason to why coaches didn't participate was lack of time and some coaches simply couldn't be reached.

This questionnaire was inspired by a study of Warren-Smith & McGreevy (2008) where the knowledge of learning theories in accredited equestrian coaches in Australia was studied. Question number one and four are from that study and have been modified to some extent; the rest of the questions in this questionnaire are follow up questions on that study. Since the study mentioned above revealed that only a few percent of the equestrian coaches had a correct understanding of learning definitions it was decided to remove the terminology from the questions. Even though some answers were closed everything that could be of interest was noted. One of the reinforcements is referred to as releasing the aid, which means releasing a pressure.

The following questions were asked:

1. In what situations do you use patting/ scratching/ preferred food/ releasing the aid/ vocal praises? Each reinforcer is answered separately.

Open ended

2. When you train horses, do you use patting/ scratching/ preferred food/ releasing the aid/vocal praises in order to teach the horse a behavior? Each reinforcer is answered separately.

Yes/ No

3. If yes on question number 2: When do you reinforce the horse after it has performed a wanted behavior using patting/ scratching/ preferred food/ releasing the aid/ vocal praises? Each reinforcer is answered separately.

Immediately / In a few seconds/ Longer.

4. If yes on question number 2: How effective do you find patting / scratching/ preferred food/ releasing the aid/ vocal praises in order to teach the horse a behaviour? Each reinforcer is answered separately

Effective/ Unsure/ Ineffective

5. Can you give examples of two situations when the horse does something wrong and it is corrected or punished with some kind of pressure, pull, sudden movement or noise?

Open ended

6. When dolphins and laboratory monkeys are trained, a clicker (that releases a clicking sound) or whistle is often used. The aim is to, with a sound, mark the exact moment that the animal performs the right behavior and after that the animal is given a reward it likes. Is this something you use when training horses?

Yes/ No

7. Do you think that horses would feel better if more praises and preferred food was used in training?

Yes/No

8. Can you suggest two situations where praises and preferred food would not be useful?

Open ended

3 RESULTS

3.1 Literature search

3.1.1 Positive effects of positive reinforcement

Positive reinforcement has been shown to have positive effects on training such as more trial and error behaviors and an increased motivation to train (Innes & McBride, 2008). It could also be argued that more trial and error behaviours could be a safety concern since the trainer to a lesser extent will be able to anticipate what behaviour the horse is going to perform. If adding positive reinforcement to learning a frightening task enhances learning is debated, Heleski *et al.* (2008) argues it does, however this is contradicted by a study of Sanky *et al.* (2010). Ferguson & Rosales-Ruiz (2001) results show that target training and shaping as a method to trailer load horses decreases unwanted behaviors and could therefore make training more safe and easy to the handler. A study by Innes & McBride (2008) showed a tendency for horses reinforced with both negative and positive reinforcement to come closer to a novel object than horses trained using only negative reinforcement. In trailer loading situations and when habituation is sought this could be very useful. If horses are rewarded with food during training they accept the handler more quickly, keep closer to the handler (Sankey *et al.*, 2010) and make more contact attempts to the handler (Sankey *et al.*, 2010; Innes & McBride, 2008), these positive outcomes lasts for several months following the handling and are generalized to unfamiliar humans (Sankey *et al.*, 2010).

The arguments for the use of positive reinforcement is among other things that the amount of aversive pressure used can decrease, for example Warren-Smith & McGreevy (2007) compared two ways of shaping a halt, one group (control) was shaped using negative reinforcement only and one group (experiment) was shaped using both positive and negative reinforcement. Horses in the experimental group seemed to shake their head less, lick their lips more and there seemed to be a tendency for greater roundness of the body than in the control group (Warren-Smith & McGreevy, 2007). These are all displays asked for in competition and maybe the use of positive reinforcement could decrease the number of corrections on horses by the rider during training and competition in order to reach these display criteria (Warren-Smith & McGreevy, 2007), this could in turn increase the horses welfare.

3.1.2 Negative effects of positive reinforcement

It has been shown that food deprivation to some extent affects the energy and effort the animals put into responding for food (Pearce, 2008). There may therefore be a risk of abusing the use of positive reinforcement by having the horses deprived of food or water in order for them to be highly motivated to training. In fact, water deprivation was used in a maze learning tests by Kratzer *et al.* (1977). This could affect the welfare of horses negatively.

The lines between positive reinforcement, negative reinforcement, positive punishment and negative punishment are at times diffuse and this could result in other emotional impacts experienced by the horse than the once expected. For example, Perone (2003) argues that if

hunger is an aversive stimulus for the animal and food is used as a positive reinforcer, then hunger may decrease and the method could then be considered a negative reinforcement also. It is also shown that during extinction tasks, where the horse expects to get reinforcement but does not, the horse can experience frustration (McCall & Burgin, 2002; Williams *et al.*, 2004) which is a feeling experienced when negative punishment is used (Rolls, 1990). It could be argued that negative punishment is used in situations when positive reinforcement is expected but not always obtained, then this feeling of frustration could be experienced during the process of shaping or when fixed ratio reinforcement intervals, reinforcing for example every fifth correct response, is used.

3.1.3 Factors affecting learning

If wanting training to be effective and when using any reinforcer it is of great consequence to have knowledge in what factors that affect learning. As suggested by Mills (1998) and Pearce (2008) the choice of reinforcer, contiguity (the closeness of events in time) and contingency (to what extent two events are connected) are such factors. For example, the palatability of the food used to reinforce doesn't seem to affect the rate of learning a conditioned response but if changing from a palatable food to one that is not as palatable a decrease in conditioned responses can occur and in some cases extinction (Ninomiya, 2007). Hence it would be good to reflect on what kind of food to use as a reinforcer. Regarding contingency a study by Myers & Mesker (1960) showed that a horse can adapt to being reinforced every eleventh time it does the wanted behavior and that the response rate then increases and is relatively stable. In another study (McCall & Burgin, 2002) there was a tendency for horses to learn a new task trained only with a secondary reinforcer, clicker, if previously having been trained with a combination of a clicker and food reward, but the horses quickly lost interested in the activity when primary reinforcers were not delivered.

3.2 Interviews

The material is limited and these data should not be considered a representative sample but they are still relevant to point out certain real life occurrences. One coach didn't have time to answer all questions, thus the number of coaches who answered the questions is indicated.

Potential Reinforcers ↓	To teach the horse a behaviour	Delivery of reinforcer			Percieved Effectivness		
		Immediately	In a few seconds	Longer	Effective	Unsure	Not effective
Patting	4	1	3		3		1
Scratching	1			1		1	
Favorite food	2			2	1	1	
Releasing the aid	5	5			4		1
Vokal phrases	5	5			3	1	1

Table 2. Reinforcers used to teach the horse a behaviour, delivery moment and perceived effectivity (n=5).

Primary reinforcers: (n=5)

Favorite food was only used by two coaches to teach the horse a behaviour and from those it was considered efficient by one. Favorite food is also used to get the horse to concentrate, get contact with nervous horses, when teaching the horse something new and to create a relaxed relationship to the horse. Most coaches gave the horse some preferred food before mounting and after the training session was finished

Negative reinforcement, releasing of an aid, was systematically used by all coaches when the horse had done something right and was the primary reinforcer most frequently used. Some coaches said that negative reinforcement is a very important reinforcer and that riding is built on it.

Scratching was used only by one coach to teach the horse a behaviour. Other areas of use was to calm horses down, make them feel safe and to create a relationship to the horse. Two coaches said that in order to make scratching useful it was important to know if the horse liked being scratched and where it liked to be scratched.

Secondary reinforcers: (n=5)

Patting on the neck was used mostly to calm horses down or as a greeting. Two coaches pointed out that they used mostly stroking and not patting, they considered patting sometimes to be too violent. Patting on the neck was also used in teaching the horse a behaviour by four coaches and was often combined with the releasing of an aid and vocal praises.

Vocal praises were used by five coaches to teach the horse a behaviour, it was considered useful by three of the coaches. Vocal praises were also used to calm horses down and positively affect the horse's mood. It was also used when longing a horse and when other reinforcements were difficult to apply

Examples of situations where praises and preferred food was not considered useful: (n=4)

Coaches gave examples of different situations. Some quotes: "When horses behave aggressively, kicking or biting", "When the horse is tense it may not respond to patting or sweets", "In dangerous situations when the horse is standing on its' hind legs, running over people or tearing away", "In some trailer loading situations", "Stallions that are busy looking for mares", "Young horses that does not know where they have their own body" and "There are no situations where positive reinforcement is not useful, everyone likes praises".

Examples of two situations when the horse did something wrong and was corrected or punished: (n=5)

Coaches gave examples of different situations. Some quotes: "If the horse doesn't respond to pressure, pressure may have to be increased", "If you're walking a horse and it passes you, then you will have to stop it, but it's not a jerk but more of a stronger pull", "When walking a horse and it is difficult to get contact with it you may have to increase the

pressure “, “Before punishing it is important to work out if the behaviour came up through learning, there is always a reason to why animals behave a certain way, probably you just haven’t been obvious enough and thereby created a conflict”, “Tougher horses need tougher hands” and “If the horse is not standing still in the stable while handling it could be dangerous and the horse may have to be corrected, but not punished because that scares the horse and could be dangerous too. It’s more of consistency training”

Would it be possible to train horses without using punishments or corrections? (n=5)

Coaches gave examples of different situations: “You have to teach the horse what is right and what is wrong, somehow you will have to show the horse what is right”, “Some horses are used to corrections and they can stand anything, they may have difficulties accepting praises”, “Stallions can become dangerous if they get ascendancy, you have to keep them within certain limits” and “Every signal you give the horse is a small punishment”

Clicker training: (n=5)

None of the respondents used clicker in training but other secondary reinforcements like vocal praises and pats were used in combination with negative reinforcement. These secondary reinforcers were given at the same time or after the release of the aid which is a primary reinforcer. Primary reinforcers such as favorite food were only given by one coach subsequent to vocal praises and release of an aid. In this situation the food was delivered a couple of seconds after the other reinforcers and therefore there was a delay in primary reinforcement.

Four out of five coaches seemed to have a positive attitude to clicker training and none had a negative attitude towards clicker training. One of the coaches was very interested in the research being done and asked for examples. Quotes about clicker training: “I definitely believe it works, it has been proven successful in dog training. I have colleagues using it. All consistency training is useful” and “It could work but I don’t use it because I will not be able to use it in competition. It has to be functional and legal in competition.”

Delays in reinforcement and Effectiveness/usefulness: (n=5)

All coaches who used favorite food and scratching as reinforcement and three out of four who used patting as reinforcement said it took more than a second to reinforce the horse. Whereas five out of five coaches said that releasing the aid and vocal praises were delivered immediately subsequent to wanted behavior. Not all coaches used the reinforcements suggested. Those who used them were asked whether they found them useful. Four out of five believed releasing of an aid to be useful. Three out of five considered vocal praises to be useful. Three out of four believed patting to be useful. One out of two considered favorite food to be useful. None believed scratching to be useful. Of the reinforcers used to teach the horse a behaviour, the release of an aid was considered most efficient by the trainers.

4 DISCUSSION

4.1 Discussion of the results

The results from the interviews showed that all reinforcers; patting, scratching, favorite food, releasing of an aid and vocal praises were used to teach the horses a behaviour. There were differences in how many coaches that used the different reinforcers, when they used them, the contiguity and the perceived effectiveness of the reinforcers. Negative reinforcement as in the releasing of an aid was systematically used by all coaches. Positive reinforcement on the other hand was used by some coaches in some specific situations. Three of the coaches said they used scratching to calm horses down. This observation is supported by Normando *et al.* (2003) and Feh&Mazières (1993) who showed that when a horse is being manually groomed on a preferred site, usually at the base of the neck, including the withers, their heart rate decreases significantly. Horses also show significantly more positive behavioral responses when scratched at a preferred site (McBride *et al.*, 2004). If a horse is scratched at places to where agonistic interactions is usually directed (Feh&Mazières, 1993) or at places nearly ever groomed by free-living horses (Normando *et al.*, 2003) the heart rate is unaffected. Interestingly, two coaches drew attention to the importance of knowing if a horse likes being scratched and were.

Positive reinforcement by the delivery of food was used only by two coaches to teach the horse a behaviour, but it was used by all coaches in other situations, such as when creating a relationship or as a random treat. Why food as a reinforcer was not used by all coaches in teaching the horse a behaviour even though food is a primary reinforcer can possibly be explained by food not being a traditional method for training horses, it could also be the difficulty in delivering food immediately subsequent to wanted behaviour and therefore generating a delay in reinforcement. An immediate reinforcement is most efficient in instrumental conditioning and if there is a delay in reinforcement instrumental conditioning will occur but to a lesser extent (Pearce, 2008), this could result in coaches finding food as a reinforcer ineffective. In this case it could be important to use a secondary reinforcer such as clicker or voice to mark the wanted behaviour.

None of the coaches used a clicker but there seemed to be a positive attitude to it. Taking into account the positive outcomes of clicker training (Ferguson & Rosales-Ruiz, 2001) and the positive attitudes to clicker training there might be a future increase in the use of a clicker in training horses. One coach mentioned that whatever training procedure is used in training it has to be functional and legal in competition. This is very interesting and important to point out since there are probably numerous people competing or wanting to compete, but there may be a misconception that if using a clicker it would always have to be used, that is not the case. A clicker is not the signal to the horse what has to be done, but the signal that marks the correct behaviour. A clicker can for example be used to shape behaviours and when a wanted behaviour is finally obtained a signal can be added that produces the wanted behaviour whenever presented. However, the wanted behaviour would still have to be reinforced in some way to keep it being presented at the presentation of the signal. Vocal praises, which can be considered a secondary reinforcer, was used by all coaches to teach the horse a behavior. The reason to why vocal praises are considered useful even though they are supposed to be neutral could be that they seem to always be paired with a primary reinforcer such as the releasing of an aid. One coach did point out that she uses vocal praises but that the releasing of an aid is always the most important of

the reinforcers. Other secondary reinforcers as patting was used but just as vocal praises it was delivered at the same time or after a wanted behavior and as mentioned in the introduction that is not sufficient enough to have the horse making a connection between the primary and secondary reinforcer. Maybe vocal praises and pats in some ways are more benefitting to the trainer.

It would also be of importance to find out in what situations some reinforcers are not considered useful since this could indicate limitations of the reinforcers. The results show that situations that can become dangerous are situations where coaches use punishment. The coaches may be right in saying that horses that are in a state of fear, anxiety or excitement may not respond to positive reinforcement, but some situations can be prevented by using positive reinforcement (Ferguson & Rozales-Ruiz, 2001). Other preventing training procedures involves time, practice (Haupt, 1982), desensitization, which is a slow and gradual increase of the aversive stimuli and has as a result that the horse no longer reacts to that stimuli (Christensen *et al.*, 2006) and breaking up difficult training practices in to smaller and easier parts and train the parts separately (Shanahan, 2003). An example of a situation where positive reinforcement was not considered useful by the coaches in this study was when the horses was biting and kicking. McGreevy (2004) proposed that kicking could be a sign of fear and/or aggression and should be approached by preventive training and restoration of the human- horse bond. Interestingly enough McLean (2005b) found that kicking and biting is linked to dysfunctions in the go and stop signals from the trainer. The trainer may therefore be responsible for these behaviours and could maybe prevent them by clarifying the stop and go signals. This was also pointed out by a trainer saying that it is important to know how a behaviour was created and that there is a reason to why animals behave the way they do.

4.2 Welfare implications

Whether or not positive reinforcement will improve the welfare of horses is a subject of discussion. If it doesn't improve welfare there is no reason to integrate it to training and if it does then maybe this is a small step towards a better life for our horses. Using positive reinforcement more means using less negative reinforcement that relies on the use of aversive pressure. It is argued that if negative reinforcement is used properly the horse will learn to react to mild pressure (McGreevy, 2004) and may in time learn to predict outcomes of signals and may experience calmness to some extent. Therefore it could be argued that the correct use of negative reinforcement is not the major welfare concern in training horses, but that the incorrect use of negative reinforcement and punishment could amount to abuse. However, as mentioned in the results the integration of positive reinforcement could reduce the number of needed corrections during riding and there also seems to be several other positive outcomes to training such as the horse accepting the handler more quickly and a reduction in number of unwanted behaviours performed by the horse, therefore it would be of interest to know how the use of positive reinforcement can be integrated to training and riding.

4.3 Integration of positive reinforcement in training

The participating coaches in this study seemed to be interested in how positive reinforcement could practically be delivered, one coach brought this up “If we are to use positive reinforcement we are to find a way to deliver the reinforcement every time the horse does something right”. Even though there is an interest in positive reinforcement the knowledge in how this can be practically integrated in horse training is lacking. Sigurjónsdóttir (2007) says that it is of importance to provide trainers with results of scientific studies in a way that is comprehensible. Considering all the above, training horses from a distance or if wanting to use positive reinforcement but finding it difficult to deliver while riding, secondary reinforcers paired with a primary reinforcer at fixed ratio intervals can be very useful. As mentioned in the result there are several factors to take in to consideration when choosing what reinforcer to use, e.g. palatability if using food, contiguity and contingency. Moreover, having the right equipment positive reinforcement can in fact be delivered to the horse’s mouth every time it does something right. In a study by Warren-Smith & McGreevy (2007) this innovative method was tried by delivering molasses water straight to the horse’s mouth via plastic tubing attached to a syringe at the horse’s back. If using a device like this many behaviors could be positively reinforced during riding and the use of aversive stimulus could possibly be reduced.

Even though it is possible to integrate positive reinforcement to horse training there may also be certain behaviours we may not be able to obtain using only positive reinforcement. Cooper (1998) suggests that an animal’s behavioural ecology is responsible to how the animal learns. In the wild the stimuli to generate a flight response is to be aversive and the release of pressure is the most probable reinforcer when fleeing from a predator, thus reinforcing flight with food may not be effective e.g. during the starting moments in gallop and trot competition. Is it that we can only produce feeding behaviours using food as positive reinforcement and obtain trot, gallop or flight responses using aversive pressure?

4.4 Limitations of this study and other studies

The number of coaches interviewed was little and that could affect the results. However, these coaches teach future coaches who in turn will be teaching many people, as a result the kind of training techniques the top-level coaches uses may be reflected in what many other people will be using. The way to choose coaches to interview may not have been the best regarding that some were recommended to me. If this is to be done again all coaches should be chosen randomly, though in the end the majority of the coaches who agreed to participate were the ones that were randomly picked from lists on the internet.

Learning theory is a huge area and the articles used in this study are only a small part of everything that has been published. In some of the articles (Heleski *et al.*, 2008; Warren-Smith & McGreevy, 2007) covering positive reinforcement in training horses the exact moment of when the positive reinforcement is received by the horse is not mentioned. That is, the reader cannot tell how long the gap between the wanted behavior and the reinforcement is and as mentioned before, this will affect to what extent the animal makes a connection between the behaviour and the reinforcer (Pearce, 2008). McGreevy and McLean (2007) proposes that for optimal training results it is important that the training steps are consecutive and that the task asked for is not too difficult for the horse. In one

article (Heleski *et al.*, 2008) the training sessions were short in time and if the horse didn't succeed it was considered to have failed. Optimal training results are probably not possible to achieve in a very short time and therefore it is suggested that the long term consequences of different training techniques are to be considered when researching this area.

5 Conclusion

The results show that negative reinforcement seems to be the foundations of training horses whereas positive reinforcement is used but not to the same extent. Integrating positive reinforcement to training may enhance welfare of horses and will make the task easier for the handler. Secondary reinforcers are used but unsystematically, using a secondary reinforcer such as clicker correctly can enable the use of positive reinforcement during training of horses.

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