

# It Just Clicks! – Positive Reinforcement in Horses

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# Comments Page

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# 1. Summary/Abstract

The main aim of my BT Young Scientist Project is to show the value of clicker training as a horse training technique. To do this, a study was conducted to compare clicker training with more conventional horse training methods. There was a second study conducted to ascertain the knowledge and use of clicker training in Co. Kerry. The third study involved complex behaviours and problem solving in horses.

**Study 1** A comparison between training with positive reinforcement, negative reinforcement and both positive and negative used together was conducted. Three groups of five horses were trained a sample behaviour (to lower their head to the ground). One group was taught using each training method. After analysing video footage of each training session, times and statistics were produced for each horse. Clicker training proved to be more effective and more efficient than the conventional methods used.

**Study 2** A survey was conducted among horse trainers/owners regarding training techniques, issues and their understanding of clicker training. Many horse owners have interest in clicker training and have training issues that could be potentially solved with clicker training.

**Study 3** was designed to demonstrate the use of clicker training to train complex behaviours and to investigate problem-solving behaviour in horses. The horse was taught two complex behaviours and then presented with a problem. Although I was able to teach the complex behaviours, on this occasion, the problem solving aspect of the project was unsuccessful.

It is proposed that the widespread use of clicker training would lead to better interactions between horses and people and improve the standard of horse training in Ireland.

## 2. Introduction

The reasons for doing this project come from my own experience of owning and training horses. I have been working with horses for the past nine years and have been using clicker training with my own horse for the last three. Since I began using clicker training, I have seen a complete change in my relationship with my horse and the quality of interaction between us. Clicker Training has given us tools for communication and a way to work together, instead of against each other. It has taken the frustration and confrontation out of the time spent with my horse and made this time more enjoyable. I have trained many things which I never thought my horse and I were capable of and more besides.

Most horse training involves positive punishment in the form of corrections or excessive pressure. There are a number of key differences between this and clicker training techniques, for example when training a horse to stand quietly. Traditionally, a horse would be punished for fidgeting and rewarded for standing quietly. A trainer using clicker training would use a series of successive approximations to shape this behaviour. They would click and reinforce a horse for pausing with all four feet on the ground, even if it was only for a second. They would then begin to withhold the click, for a second or two at a time, until the horse can consistently stand still when asked. By building up the duration slowly, the horse is successful every time and the behaviour continues to be reinforced. Negative reinforcement could be added by applying pressure to the headcollar when the horse was fidgeting and releasing when the horse was still, so the animal is consistently being rewarded for the same behaviour. In contrast, punishing the animal for fidgeting increases the stress and is likely to exacerbate the undesired behaviour. For this reason, positive reinforcement is particularly effective for nervous or excitable animals.

There are very few people in Ireland using clicker training, and there seem to be many common misconceptions surrounding it and particularly the use of food during training.

Ireland has a large population of horses, it is difficult to get an accurate figure, but it is likely to be in excess of 200,000 sport and leisure horses, outside of the thoroughbred industry. Many young people who become horse owners do not have a positive experience, and give up. The economic downturn has greatly reduced the demand for horses, and a large number are now unwanted or neglected.

Many horses in Ireland are not well trained, even to the extent of the basic obedience and good manners, which make such a difference to the interaction between horse and human. It is proposed that a more widespread knowledge of learning principles in animals would

improve both the value of the national herd and the quality of interactions between horses and their owners – the pleasure of being around these wonderful animals. This is particularly important for people new to horses, when the sort of experiences they have makes a big difference to their attitude to the sport.

Traditional training methods for horses involve the use of force for control and the threat of punishment to make the horse do what the handler or rider wants. These methods generally get results, but studies in a number of species have indicated that a positive reinforcement approach is better in a number of respects. Clicker training is an extension of the positive reinforcement approach, where an auditory cue is used to make a clear link between the desired behaviour and the reward.

The studies undertaken in this project were three fold; firstly to compare the effectiveness and efficiency of clicker training in horses with more traditional training methods, and secondly to assess the knowledge of and attitudes to clicker training among local horse owners. Finally, clicker training was used to train a horse in two complex behaviours. Once the two behaviours had been learned, an attempt was made to see if the horse could demonstrate creativity by combining the two behaviours to solve a problem. This has been demonstrated in a number of species including chimpanzees and pigeons, but to my knowledge never conducted in horses.

## Literature Review

### Training Techniques

Classical (Pavlovian) conditioning was first demonstrated by Pavlov (1927). In experiments with dogs, Pavlov noticed that laboratory dogs salivated before the presentation of food, in the presence of the person who usually fed them. He then conditioned the dogs to salivate at the sound of a bell, by ringing a bell before presenting the food.

Operant conditioning was first defined by B.F. Skinner (1939). It is a method of learning by associating behaviours with consequences (reward or punishment). There are four main components to Operant conditioning:

1. *Positive Reinforcement* is the addition of a desired stimulus
2. *Negative Reinforcement* is the removal of an aversive stimulus  
Reinforcement increases the frequency of a behaviour
3. *Positive Punishment* is the addition of an aversive stimulus

#### 4. *Negative Punishment* is the removal of a desired stimulus

Punishment decreases the frequency of a behaviour

N.B. It is important that in this context, positive refers to the addition of stimuli and negative refers to the removal of stimuli, not as the terms are usually understood, i.e. good/ bad.

Another component of operant conditioning that is used in horse training is *Extinction*, where there is no consequence when a behaviour occurs. This leads to a decrease in the frequency of the behaviour.

**Clicker Training** is a training method that uses positive reinforcement and an acoustic marker signal (the click). The click acts as a bridge between the behaviour and the reinforcement, and allows specific and precise behaviour to be reinforced.

*Shaping* is training by reinforcing a series of progressive approximations of the target behaviour. When using shaping, the horse is observed and the trainer clicks for any small approximation of the desired behaviour. At each click the horse get reinforcement in the form of a treat. As the horse begins to understand what the desired behaviour is, the criteria increase, so that the horse has to do more each time to earn reinforcement. There are a number of advantages to this: it can be done from a distance, making it possible to work with aggressive, dangerous or very timid horses from a comfortable and safe distance. Shaping allows for modifying behaviour, it enables the trainer to gradually change the criteria and develop the response gradually. Also there are a huge variety of behaviours that can be trained using shaping. Certain behaviours for example “equine Pilates” (where the horse is trained to tense certain muscles) and training the horse to put its ears forward on cue could not be trained without the use of shaping.

Marian and Bob Bailey, graduate students of Skinner, first developed clicker training. They worked on applications for the US Navy during WWII and founded Animal Behaviour Enterprises, an animal training company which created commercial animal shows, with marine mammals, as well as the first free-flying bird shows.

Karen Pryor’s book *Don’t Shoot the Dog* (1984) brought clicker training to the general public, as people began to use clicker training for dogs.

Clicker Training is now being applied to many different situations, and species including pets such as dogs, cats, rabbits, and rodents. It has been used for assistance animals, rescue animals, and even to teach humans things such as sports, dance, and for young children or those with special needs (TAGTeach).

In 1993, Alexandra Kurland began clicker training with her horse. Her first book on equine clicker training, *Clicker Training for Your Horse* was published in 1998. Since then Alexandra has published two more books and a series of DVD lessons and gives clicker-training clinics around the world.

Many horse people have issues with the use of food as a reward during training. There is a belief that it leads to the horse biting, and causes poor manners. However, this is not necessarily the case. By using food as reinforcement the horse is highly motivated, as food is a primary reinforcer (necessary to sustain life). Horses' digestive systems are designed to graze, and it is natural for them to eat small amounts of food throughout the day. This makes food an ideal reinforcer.

Hockenhuil and Creighton (2010) conducted a study about unwanted oral investigative behaviour in horses and the hand feeding of treats. They concluded that hand feeding was significantly associated with three out of five of these unwanted behaviours (licking hands, gently searching clothing and roughly searching clothing). However, two other behaviours (nipping hands and biting clothes) were not associated with hand feeding, which means that there is a different cause for these behaviours. There was no association found between clicker training and any of the unwanted behaviours. These conclusions suggest that horse owners should not be deterred from food-based positive reinforcement techniques (such as clicker training) "as fears that this practice will result in unwanted oral investigative behaviours from their horses appear unfounded".

The fact that hand feeding alone was associated with the unwanted behaviours, and that clicker training was not, means that clicker trained horses have better manners around food than those fed by hand but not clicker trained. This is because when food is used in clicker training, the horse learns that there will only be food presented after a click, and is specifically trained behaviours that earn reinforcement instead of searching the trainer for treats.

McGreevy (2009) identified a continuum between poorly timed negative reinforcement and punishment. This is important, because as horses are largely trained by negative reinforcement, they are likely to be inadvertently punished. It is vital that negative reinforcement is used in a way that avoids punishing the horse.

Ferguson and Rosales-Ruiz (2001) developed an effective method of trailer loading horses based on the principals of positive reinforcement. They used techniques also used in this study such as targeting and shaping.

Murray (2007) identified a difference in the result of training using positive reinforcement and using positive reinforcement as well as corrections. This is an effect known as the poisoned cue and can lead to hindered learning and unwanted emotional behaviour.

In a study by Sankey et al, (2010), using food rewards was found to have beneficial effects on horses' attachment to humans and facilitated learning, whereas the tactile contact was clearly not perceived sufficiently positively, neither for bonding to occur, nor for enhancing learning. This study compared the use of food rewards and grooming as positive reinforcers. The use of food was a better reinforcer, as the horses learned the behaviours better, and also it contributed to the building of a bond between the horse and trainer.

In a separate study, Sankey (2009) showed that the use of a reward as part of training induced positive behaviour towards humans during this learning, and enhanced the memorisation of the task itself. It also “increased contact and interest, not only just after training, but 6 and 8 months later, despite no further interaction with humans”. This positive recollection of people extended to novel persons.

#### Problem Solving In Horses

Epstein et al. (*Insight in the pigeon*, 1984) replicated a problem solving behaviour in pigeons observed by Köhler (1925) in chimpanzees, in which the animals used a box to reach a bunch of bananas placed out of reach, overhead in their enclosure. In the *Insight* study, the researchers found that pigeons that had acquired the relevant skills solved the problem very effectively and in “a remarkably chimpanzee-like (and, perforce, human-like) fashion”.

## 3. Study One

### Aims

The purpose of this study is to compare the effect of using clicker training (positive reinforcement) vs. more traditional training (negative reinforcement) to teach a horse the same behaviour. In the study, fifteen horses were trained to lower their head to the ground.

Headlowering is not a commonly trained behaviour, but it is a very useful method of calming a frightened or exited horse. An anxious horse will have its head high in the air; this is a natural instinct, which allows it to see potential dangers all around. A horse will only have its head on the ground if it is relaxed, and feels safe enough to graze etc. By asking a stressed or exited horse to lower its head, the horse can deal with these emotions in a safe way for both horse and handler. Instead of punishing horses for undesired behaviour, clicker trainers train incompatible behaviours: for instance, a horse cannot rear and put its nose on the ground at the same time, so the headlowering will discourage this dangerous behaviour. It would be difficult to train this using other training methods, as pressure or punishment would not encourage a horse to calm down.

### Methods

Three groups of five horses were used as subjects: nine mares, five geldings and one stallion. None had any previous history of clicker training, and had not been trained before using food as a reinforcer. Training was held in an enclosed area such as a stable, or in some cases, a roped off section of yard.

None of the horses used had experience of clicker training, and all had been trained using some type of negative reinforcement. The training of the positive reinforcement groups began with a targeting session to introduce the clicker, where the horses were trained to touch a target to earn a reward. Each training session continued until there was a notable improvement in the behaviour or when there was no improvement after a time limit of 10 minutes. Sessions generally finished with a significantly improved repetition. Targeting sessions lasted between one and two and a half minutes and headlowering between one and ten minutes. This varied hugely between horses.

Two or three horses were trained simultaneously; this allowed a training session to be done with one horse while the other(s) had a break in between sessions.

In the case of the positive reinforcement Groups (1 and 3), either chopped carrot and apple or grain was used as the positive reinforcer.

**Group 1** were trained by positive reinforcement only (+R). With these horses training began with a short targeting session (between one and two minutes). The purpose of this is simply to introduce the horse to clicker training, and teach it that each click leads to reinforcement and that it has to DO something to earn reinforcement. The session ended as soon as the horse appeared to understand the basic concept:

Behaviour => Click => Treat.

In the next session, the trainer stood in a neutral position, out of the way of the horse and observed. As soon as the horse dropped its head at all, it heard a click and was reinforced. As the horse does this more consistently and intentionally, the criteria were gradually increased and only the better repetitions were reinforced.

**Group 2** were trained using negative reinforcement only (-R). Negative reinforcement is the removal of an aversive stimulus as the horse does the desired behaviour. In this case the application and release of pressure to the horse's headcollar was used.

This was done by standing at the horses left shoulder, holding the leadrope in the right hand, sliding down the leadrope with the left hand and applying pressure to the horse's headcollar. As soon as the horse lowered its head, the pressure was released and the rope let go. The pressure on the horse's headcollar was not increased if the horse was not responding, but held until the horse gave the required response and then released.

Traditional horse training methods would not use negative reinforcement in this way, but instead the release would not occur until the horse has completed the behaviour, and if the horse did not respond the pressure would increase.

**Group 3** were trained using both positive and negative reinforcement (+R&-R). This was done by the trainer standing at the horse's left shoulder, lifting the rope with right hand, sliding with left hand to the snap of the leadrope and applying pressure to headcollar. The pressure was released as soon as the head began to lower, at the same time the horse heard a click and was reinforced. The criteria were increased as training progressed, the pressure was still released as the horse's head began to lower, but shaped (selected better repetitions) so that the horse was putting its head closer to the ground each time.

A cue is a stimulus that tells the horse what behaviour is likely to be reinforced. In the case of Groups 2 and 3, the cue for headlowering is the trainer sliding down the leadrope and putting pressure on the horse's headcollar. The Group 1 horses did not have a cue for the behaviour, because when shaping is used, the behaviour is taught first and then the cue is attached.

## Results and Discussion

For each horse, a number of results were recorded:

1. The total time spent training (including targeting session for Groups 1 and 3)
2. The time spent training headlowering
3. The headlowering training time until the horse achieved a third complete repetition in succession.
4. The average time between each reinforced headlowering repetition
5. The number of reinforced headlowering repetitions
6. The number of repetitions until three complete successive repetitions
7. The total number of complete repetitions
8. The number of training sessions

All times are in minutes and seconds.

### Group 1 - Positive Reinforcement (+R)

		<b>1.</b>	<b>2.</b>	<b>3.</b>	<b>4.</b>	<b>5.</b>	<b>6.</b>	<b>7.</b>	<b>8.</b>
No.	Sex	Total Time	HL Time	Time to 1st 3	Avg Time between (s)	HL Reps	Reps 1st 3	Full Reps	Sessions
1	Mare	19:53	16:53	15:38	13	79	77	9	3
2	Gelding	07:10	06:02	06:02	12	31	31	3	1
3	Mare	16:37	15:48	15:31	9	106	104	10	4
4	Gelding	16:39	14:39	04:00	19	49	15	14	2
5	Stallion	14:30	13:31	13:04	11	77	73	12	3
Average		14:58	13:23	10:51	13	68.4	60	9.6	2.6

**Group 2 – Negative Reinforcement (-R)**

		1.	2.	3.	4.	5.	6.	7.	8.
No.	Sex	Total Time	HL Time	Time to 1st 3	Avg Time between (s)	HL Reps	Reps 1st 3	Full Reps	Sessions
6	Mare	15:58	15:58	14:16	21	49	43	7	3
7	Mare	18:03	18:03		10	99		3	5
8	Gelding	17:29	17:29		13	82		11	5
9	Mare	17:33	17:33		28	36		10	3
10	Mare	36:37	36:37		13	185		1	5
Average		21:08	21:08		17	90.2		6.4	4.2

**Group 3 - Positive and Negative Reinforcement (+R&-R)**

		1.	2.	3.	4.	5.	6.	7.	8.
No.	Sex	Total Time	HL Time	Time to 1st 3	Avg Time between (s)	HL Reps	Reps 1st 3	Full Reps	Sessions
11	Mare	08:55	07:34	01:20	18	30	4	23	2
12	Mare	13:05	11:43	08:23	13	57	42	14	4
13	Mare	09:31	07:53	03:11	10	46	17	16	3
14	Gelding	05:29	04:29	02:46	7	41	25	22	3
15	Gelding	06:03	04:44	03:45	8	36	28	13	2
Average		08:37	07:17	03:53	11	42	23.2	17.6	2.8

Further observations:

**Group 1:** Horses were very focused, they constantly looked at the trainer. The headlowering seemed very deliberate and it was clear that the horse understood what was earning reinforcement. The horses repeated the behaviour, and continued to do so, even when some repetitions were not reinforced, as the trainer looked for better repetitions. All five horses achieved the objective behaviour. The horses in Group 1 were not taught a cue for headlowering, only the behaviour itself. The next step in their training would be to put the headlowering on a cue e.g. verbal cue or hand signal, using the clicker

**Group 2:** Horses seemed distracted, and were looking elsewhere. There were long periods when the horses stood still and did not respond to the pressure on the headcollar. There was no progressive improvement in the quality of the behaviour. The horses all lowered their head to the ground but this was considered to be in search of food, and not in response to the trainer. The horses seemed to learn to drop their head in response to the

pressure, but not all the way to the ground. The one horse that achieved the objective behaviour was noted at the time to be avoiding the pressure/cue by keeping her nose to the ground for extended periods. Why the horses did not all achieve the complete behaviour can be explained by the fact that the release comes when the horse begins to drop its head and there is no difference in reinforcement between the time when the horse lowers its head a few inches and the completing of the behaviour.

**Group 3:** Horses seemed very focused on the trainer, they were clearly motivated during training and understood exactly the reinforced behaviour. It is also worth noting that in this case there were two components being reinforced, beginning to lower the head (-R, release of pressure) and the lowest point the horses head reaches (+R, the click and reinforcement). An important occurrence with the +R&- R horses is that unlike the Group 2 horses, they began to lower their head before the trainer had completed asking for it, i.e. the cue had become smaller. This is very important for horse training because when training horses, especially for disciplines such as dressage, it is vital that the rider's cues are very subtle. In the case of the Group 3 horses, the cue became more subtle, and by the end of training, the cue was to lift the rope and begin to slide.

There was also a notable difference in results obtained when using the different training methods on two very nervous/ shy ponies. The first belonged to Group 3 (+R and - R) and the other Group 2 (-R), both were described by respective owners as very nervous. The first, (no.11), was very successful and achieved the objective behaviour in less than a minute and a half. The second (no.9) was not at all successful, and made no progress in over fifteen minutes of training, training was discontinued because of the lack of improvement and the stress it was causing to the pony.

## Conclusions

- When clicker training was used, all of the horses successfully achieved the objective behaviour.
- Negative Reinforcement was by far the poorest (least effective and least efficient) training technique, as four of the five horses failed to learn the behaviour.
- The combination of Positive and Negative reinforcement was the most efficient. The desired behaviour was achieved by all five horses, in an average time of 3:53.

- Clicker training resulted in a continued improvement in the quality of the learned behaviour.
- The use of clicker training resulted in smaller cues being needed.

## 4. Study Two

### **Aims**

The purpose of this study was to evaluate the awareness and knowledge horsepeople in Co. Kerry have of clicker training, to identify if training issues exist and to find out if there is an interest in clicker training.

### **Methods**

A survey of 16 questions relating to horse training and clicker training was written. See Appendix A (page 27).

This survey was hosted online where people could follow a link to complete the questions. A link was sent via email and Facebook to equestrian centres and riding clubs in Kerry.

Paper copies of the questionnaire were also distributed in my own school, Presentation Secondary School Milltown, where all the students and teachers who own or ride horses participated.

A voucher was sponsored by a local equestrian supplies shop, as an added incentive for people to participate.

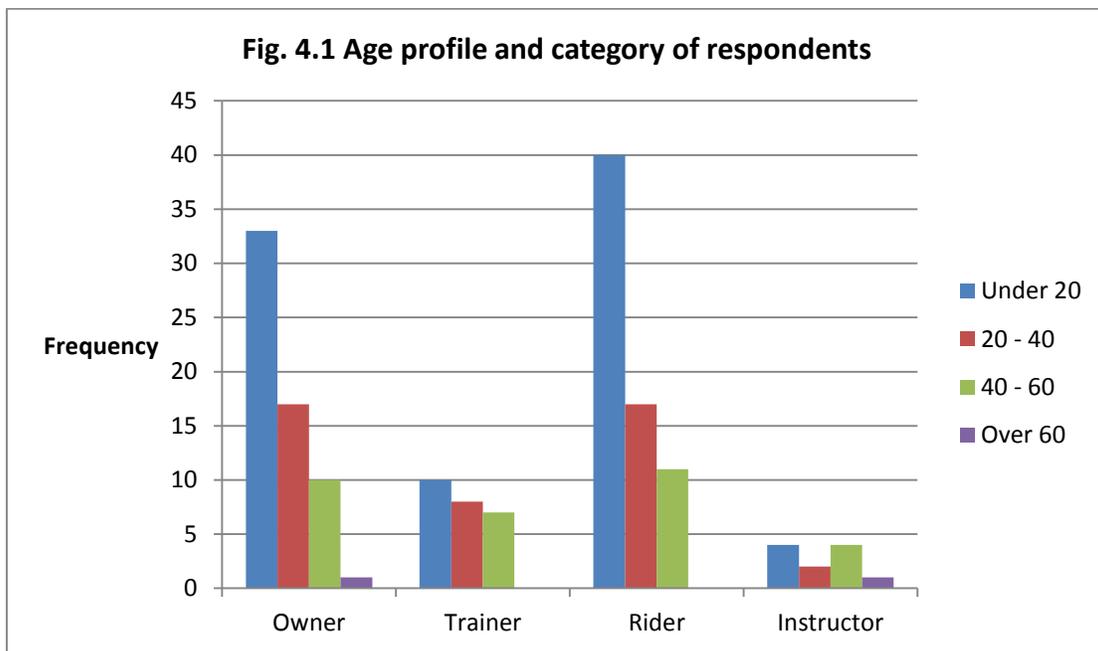
All the responses were collated into a Microsoft Excel file and SPSS software was used to produce data analysis such as cross-tabulations and percentages.

## Results and discussion

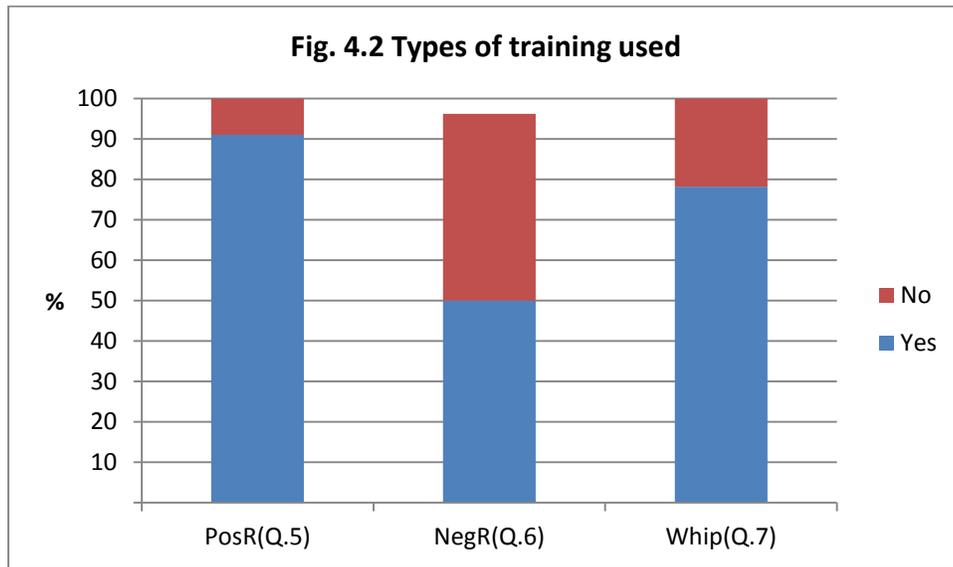
A total of 78 survey responses were received, of which 77% were female.

There were a disproportionate number of under 20s responses obtained due to the fact that the study was conducted in my school, Presentation Secondary School Milltown.

Fig.4.1 below shows a graph of the age profile (Q.2) against category (Q.4). Note that category allowed more than one answer.



**Questions 5, 6 & 7** all related to the type of training used by respondents.



91% said they use positive reinforcement during training.

Half said they use negative reinforcement. This shows a lack of understanding that people have about the training methods. Practically all horse training uses negative reinforcement because of the number of tactile (pressure and release) cues that are used in the riding and general handling of horses. This highlights the fact that many people cannot define how they train their horses and do not understand the methods they use and consequently the implications of such methods.

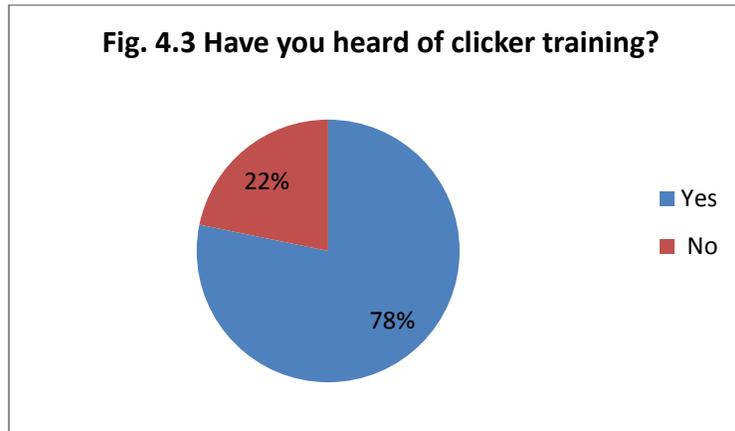
Many horse owners are not trained in the basic principles of animal behaviour or learning theory and do not use very effective methods of training. Ineffective methods of training lead to inadequately trained horses and unsatisfactory interactions between horses and people. Because of a lack of understanding of methods they are using, trainers may not be aware of the implications of these methods and the effect it has on their horse.

Question 7: “Do you use a whip while riding?” 78% of respondents said ‘Yes’. This means that a significant majority of respondents use at least one type of positive punishment (others could include verbal reprimand, excessive pressure, pulling on reins or waving object such as ropes).

At least 78% use both positive reinforcement and positive punishment in training. Positive punishment means adding an aversive stimulus for an undesired behaviour, such as the use of a whip. Pryor, K (2006) and Murrey, N. A. (2007) both reported that the use of correction (punishment) in conjunction with positive reinforcement leads to the

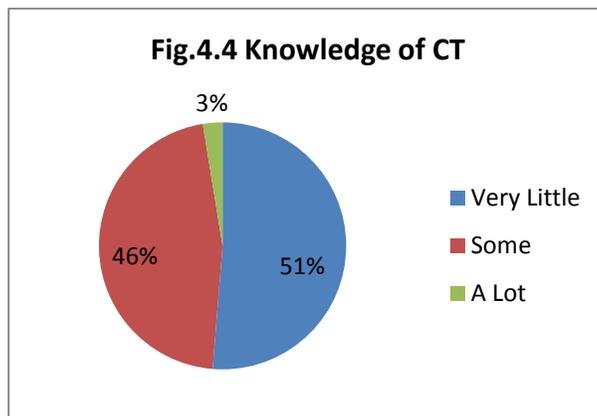
development of *poisoned cues*, where the animal has experienced both positive and negative experiences in the presence of the same cue.

**Question 8:** Have you heard of clicker training?



Over three-quarters of those surveyed had heard of clicker training.

**Question 9:** What is your knowledge of Clicker Training?

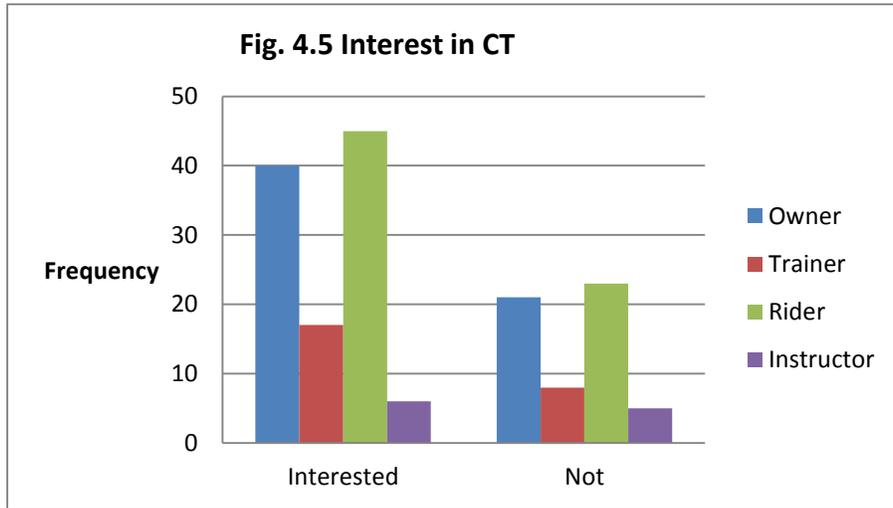


The vast majority (97%) had only some or very little knowledge of Clicker Training.

Only 2 respondents (3%) felt they knew a lot about Clicker Training.

Over half said they knew very little.

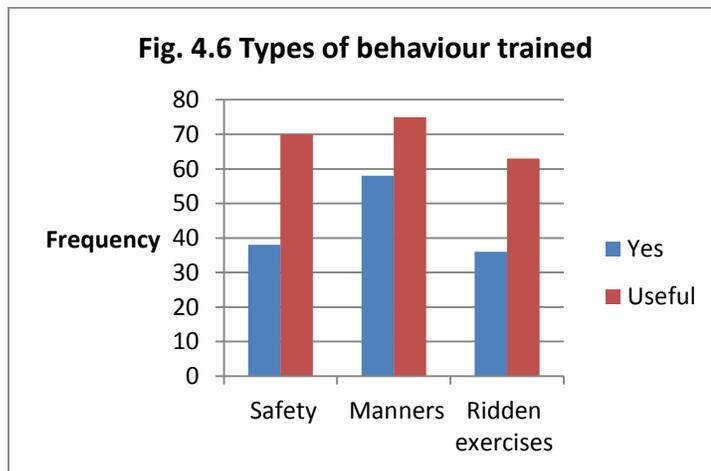
**Question 10:** Would you be interested in CT? Like to see a Demo, like to try it, or not interested.



Within each of the four categories, there were more interested in clicker training than not.

**Questions 11, 12 and 13** all related to types of behaviours trained by people.

The participants were asked if they had trained horses: for safety (e.g. stop when rider is unbalanced, calming frightened horses), good manners (e.g. ground tying, standing at mounting block) and if they trained ridden exercises on the ground. These are typical behaviours that are clicker trained.



Whilst the majority answered ‘Yes’ to these, substantially more said they would find these types of behaviours useful.

**Question 14:** If you felt clicker training was a more effective/efficient method of training would you use it? 87% of participants answered 'Yes'.

**Question 15:** Is there anything you would like to teach your horse but have not been able to?

42% (33) of respondents answered 'Yes'. Of these, 12 said they would like to teach their horse basic riding behaviours, six mentioned manners such as standing still, not biting, rearing etc, five said they would like to train their horse dressage movements, and three mentioned tricks such as lying down on cue and giving hugs.

**Question 16:** Do you have any training issues with your horse? (leading, standing, trailer loading, tacking up, traffic, shoeing etc.)

42% (33) of respondents answered 'Yes'. Of these, 13 said they have problems loading their horse into a trailer, 10 have issues with manners such as leading the horse and biting, and eight have problems with things that spook their horse such as traffic, shoeing, dogs, and clipping the horse. Seven have problems getting their horse to stand still.

## Conclusions

- Almost 2/3 of those surveyed had heard of clicker training.
- Only 3% claimed to know a lot about clicker training.
- All those surveyed showed an interest in clicker training.
- If proven to be efficient and or effective 87% said they would use it.
- Almost half the respondents claimed to have training issues.

## 5. Study Three

### INSIGHT IN THE HORSE

#### Aims

Study 3 was a demonstration type trial.

The aim of this was to show that complex behaviours can be taught using clicker training and also to show that a horse can use previously learned behaviours to solve a problem.

The problem that was used was first observed by Kohler (1917) with chimpanzees. The chimpanzee was observed to move a box and stand on it in order to reach a bunch of bananas suspended out of reach. Kohler's explanation for this was that the chimpanzee had experienced "insight".

Epstein et al, (*Insight in the Pigeon*, 1984) conducted research where pigeons were trained behaviours involving pushing a box and standing on a box in order to reach a facsimile of a banana overhead. They were then presented with the trial situation, with the "banana" placed out of reach overhead, and the box elsewhere in the chamber. Pigeons that were successful had established a repertoire of directional pushing (towards a green spot which served as a marker) and standing on the box to reach and touch the banana. In these birds, flying and jumping at the banana had been extinguished. "Each pigeon behaved in new ways when confronted with this new situation and the general finding was that the new behaviour that emerged was systematically linked to the training that the bird had received prior to training". The *Insight* study concluded that creativity (the creation of novel behaviour) depends on the training history of a subject.

#### Methods

This horse had been trained using clicker training for the past three years. The horse had experience of components of these behaviours before. He had previously been taught to touch a target. He had also been taught to pass a football to a trainer by pushing it with his nose.

The horse was trained in two behaviours, one to push a moveable box to a marker and second to stand on a stationary box and reach up to touch a target.

The first behaviour taught was to move the box. The method used for this was established through trial-and-error, and a few methods were attempted before arriving at a successful solution. The first idea was to alter the skills that the horse already had. This was done by putting the marker in between the box and the trainer. The horse would push the box towards the trainer and the trainer would click and reinforce as the horse reached the marker. This was not a success, as the horse did not learn to push to the marker, but was really pushing towards the trainer. The time spent on this training was possibly detrimental to the overall behaviour, as the horse was receiving reinforcement for pushing towards the trainer.

The successful method of training this new behaviour was to use a rope to guide the box to the marker. The marker was placed on the wall of the area, and a rope was attached to the box, threaded around a beam next to the marker, and held by the trainer. As the horse began to push the box, the trainer would pull the rope so that the box would move to the marker, and click/reinforce. The horse gradually realised that it would only be reinforced for pushing the box to the marker and began to repeat this more consistently and from a greater distance away from the marker. Once the horse had this idea, the marker was moved to different locations along the base of the wall, and the horse received reinforcement for pushing the box to these locations.

The second behaviour was taught using a method of training known as BACKCHAINING. This involves teaching the final component of the sequence first and then working backwards. The horse was taught to touch the target when held in the trainers hand, then the target was placed on a string and the height was increased so that the horse had to stretch upwards to reach it. A box was then placed under the suspended banana and the horse encouraged to stand on it and touch the banana. The prompting was then faded out until the horse would repeat the behaviour chain consistently and without encouragement.

Finally, the horse was placed in a test situation with the target suspended out of reach and the box elsewhere in the area to see if the horse could put the two behaviours together to solve the problem.

## **Results and Discussion**

In this study clicker training was successful in training both complex behaviours, which would otherwise be very difficult to train. The first behaviour was to move a box to a marker, the second was to stand on a different box in order to reach an overhead object.

These are complex behaviours that show the horse had to have an aim in doing the tasks. In the first case he had to move the box toward the marker and was rewarded when the box touched the marker, and in the second case he had to stand on a box to reach a target, and was rewarded when he touched the target. In each case it is not the initial behaviour (pushing or standing) that earns reinforcement but the result of this behaviour (get the box to the marker or reach the target)

Other interesting observations:

1. The horse stood on the box with the intention of touching the banana. This was demonstrated at one point during training when the banana had been put in a higher position than previous sessions, and the horse did not immediately see it. The horse did not stand on the box when he did not see the target, because he had not previously been reinforced for standing without touching. As soon as the horse spotted the target he stood on the box and touched it.
2. The horse generalised between the two boxes used, the moveable one and the stationary one that was used to teach behaviour two. This was often demonstrated during training, as he stood on the moveable box and attempted to move the fixed box, despite not ever receiving reinforcement for either of these behaviours. The horse also stood on the moveable box during the trial situations. At times during the training of the first behaviour, when the box was under a place where the target had had recently been, the horse stood on the box and reached upwards in an attempt to touch the target, which was not present.

The final objective of this study was for the horse to solve the problem by moving the box and standing on it to reach the target. This was not demonstrated, i.e. he did not push the box under the banana and stand on the box to touch the banana.

In the test situation, the horse did push the box although not directly towards the target at all times, he also did stand on the box, but not while it was under the target. He did not successfully put the two behaviours together to reach the target.

The problem solving behaviour required of the horse in order to find the solution to this problem consists of more than simply combining the two behaviours. In the trial situation, the marker is not present, and the horse must realise that instead of pushing to the marker, as he has done in the training, he would have to put the box in the place under the

target. This realisation would require him to understand that standing on the box allows him to reach the target when it is out of reach, which is a complex concept.

It is possible that even with totally consistent training and an ideal test situation, this particular horse would never have the ‘insight’ needed to grasp these concepts and solve the problem.

It is also possible that although this type of complex problem solving had been studied in chimpanzees and pigeons, horses, as flight animals not evolved for situations which require them to solve problems, are not capable of the thought process that would facilitate the solution of the problem. However this is merely speculation and further studies would be necessary to establish this.

The result of this study could also be attributed to the training history of the horse. There are a number of factors that may have contributed to this:

1. The training area was not ideal. There was only one useable wall, and the other three were roped off using fencing tape. This meant there were a limited number of places (along the wall) where the banana and the marker could be placed.
2. Also, because of the roped off sections, the horse could easily push the box beyond the tape and not be able to reach it. In these situations, the trainer had to enter the area in order to reposition the box within the horse’s reach.
3. The time spent reinforcing pushing the box towards the trainer has had a detrimental effect in the result. When the horse is not being reinforced very often, it resulted in resurgence of other behaviour that had previously been reinforced i.e. when the horse was not being successful (both during training and in the trial) he reverted to pushing the box to the trainer. This was also detrimental to training because the reaction of the trainer as a result of the horse pushing the box outside of the area was reinforcing to the horse.

## Conclusions

- Clicker training can be used to train complex behaviours, such as moving a box towards a marker and standing on a box to reach an overhead object.
- This study suggests that training history of a horse determines the production of novel behaviour.
- Within this study, I was unable to prove that this horse can use learned behaviour to solve a problem. However, this has not been disproved, and it may be possible to achieve the aim by amending the method and conducting a similar study at another stage.

## 6. Conclusions and Recommendations

- Since my project has proven that clicker training is more effective and more efficient than conventional training techniques. I see clicker training having massive potential for the future development of horse training in Ireland.
- Clicker training could have a major impact in resolving the many training issues that remain unsolved by other, more conventional training techniques, consequently bringing greater enjoyment to many horse owners.
- Existing education programmes need to be further promoted to bring an improved understanding and appreciation of clicker training to the general horse owners of Ireland.
- Clicker training is successful in teaching horses complex behaviours.
- Further studies are needed to investigate whether horses can use learned behaviour to solve problems.

Significant differences were observed between the use of positive reinforcement and negative reinforcement to train a horse. Shaping, or incremental learning by rewarding successive approximations of the desired behaviour, is quicker and more effective than traditional training techniques, because the horse is actively seeking to learn the desired behaviour in order to earn reward. Traditional negative reinforcement only teaches the animal to avoid the negative stimulus. In this study a combination of negative and positive reinforcement was also effective and more efficient, as the animal was both avoiding a negative stimulus and learning the desired behaviour at the same time.

As described earlier, the present study shows that positive reinforcement is particularly effective for nervous or excitable animals. Two such animals were identified by their respective owners. The animal in the positive reinforcement group was trained successfully in 2:46 minutes. Training of the animal in the negative reinforcement group was abandoned after 17 minutes.

A significant number of horse owners have training issues or things they would like to be able to train their horses. The behaviours mentioned by respondents in Study 2 have all been successfully trained using the clicker, as described by Ferguson and Rosales-Ruiz (2001) and Kurland (1998). It is proposed that the more widespread understanding and use of positive reinforcement techniques among sport and leisure horse owners would result in a decrease in these training issues, an increase in the value of the national horse population and a more positive experience for both horse and handler.

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## Appendix A: Clicker Training in Kerry

Aoife Stephens, Transition Year, Presentation Sec School Milltown

This survey is part of my BT Young Scientist Project investigating the effectiveness of different training methods for horses. The purpose of the survey is to find out how much is known about equine clicker training and how widespread its use is.

Clicker training involves positive reinforcement; this means that desired behaviours are rewarded. When the horse does what we want, it hears a click and is rewarded, eg with a scratch on the neck or a treat. This simple idea can be developed into more complex behaviours, as training progresses.

Please note I am surveying only horse owners in Kerry, and anyone outside the county will not be eligible for the draw.

1. Location (county) \_\_\_\_\_
2. Age
  - Under 20
  - 20-40
  - 40-60
  - 60+
3. Gender
  - Male
  - Female
4. Which of the following would you consider yourself?
  - Horse owner
  - Horse trainer
  - Horse rider
  - Instructor
5. Do you use positive reinforcement as part of training?

Yes

No

6. Do you use negative reinforcement (pressure and release) as part of training?

Yes

No

7. Do you use a whip while riding?

Yes

No

Sometimes

8. Have you heard of clicker training?

Yes

No

9. What is your knowledge of clicker training?

Very little

Some

A lot

10. Would you be interested in clicker training?

Would like to try it

Would like to see a demo

Not interested

Why/Why not? \_\_\_\_\_

11. Have you trained for safety (stop when rider unbalances, calming frightened horse etc.)?

Yes

No

If so, what? \_\_\_\_\_

Do you feel this could be useful?

Yes

No

**12.** Have you trained good manners (ground tying, standing at mounting block etc)?

Yes

No

If so, what? \_\_\_\_\_

Do you feel this could be useful?

Yes

No

**13.** Do you train ridden exercises on the ground?

Yes

No

If so, what? \_\_\_\_\_

Do you feel this could be useful?

Yes

No

**14.** If you felt clicker training was a more effective/efficient way of training, would you use it?

Yes

No

**15.** Is there anything you would like to train your horse to do but have not been able to?

Yes

No

What? \_\_\_\_\_

**16.** Do you have any training issues with your horse? (Leading, standing, trailer loading, tacking up, traffic, shoeing etc.)

Yes

No

What? \_\_\_\_\_

To enter the draw for a chance to win a €50 voucher for Twomey's Saddlery, Killarney, please enter your email address here.

\_\_\_\_\_

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