



In Brief: Practice and Procedure Contribution

Early training of foals using the ISES training principles

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ABSTRACT

Early experiences are known to influence the later behavior of young mammals. Training is an important part of the young thoroughbred racehorse's environment and is likely to be challenging. As with older horses, it is important to apply training methods that take into account the individual's natural behaviour (ethology) and cognition (mental actions and abilities) and to apply them in a consistent manner as possible. Foal NZ are an organization that have successfully implemented the initial training of over 3000 thoroughbred foals to date using the International Society for Equitation Science Training Principles. There are 10 independent principles that focus largely on the principles of animal learning that have been known and used successfully in a range of mammals and birds for decades. This paper emphasizes the importance of commencing training at an early age and describes the application of each training principle with young thoroughbred foals (i.e., those aged less than 8 weeks) in the context of practical training. Foals that have received consistent, evidence-based, initial training are argued to experience better welfare both during training and when they progress to preparation for their future careers. The potential positive outcomes of the application of the International Society for Equitation Science Training Principles are also highlighted for nonracing disciplines and those working in the allied industries such as veterinarians and farriers.

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Purpose

The purpose of this brief article is to demonstrate the value of equitation science–based training methods when applied to the early training of young foals. This brief provides examples of how the ten ISES training principles are applied in the initial training of young (less than eight weeks old) thoroughbred foals. Since 2003, over 3000 thoroughbred foals have been successfully trained (over a total of 18,000 foal training sessions) using these training principles by Foal NZ (formerly Equus Education NZ Ltd.) in New Zealand with no injuries to foals incurred. Foal NZ are globally recognized for their innovative work training young thoroughbred foals using methods based on the simple principles of learning theory. Foals trained by Foal NZ have become million-dollar yearlings in the sales ring and multiple winners of group one races (e.g., So You Think, Military Move and Jimmy Choux). The three parts of the Foal NZ equine training business are foal education, research, and consultancy. Together these encourage

industry practitioners to use evidence-based practice (Randle and Waran, 2017) to improve the practical delivery and application of the ISES training principles to improve welfare and training performance of young horses.

Why is a safe-to-handle horse important?

Many commercial horse breeders recognize that producing calm, well-trained young horses translate into fewer injuries for both horses and staff. This view aligns with numerous research findings, for example, O'Connor et al. (2018) and Hawson et al.'s (2010) conclusion that reduction of the "unpredictability" aspect of horse–human interactions can help mitigate against injuries incurred by humans.

Foal NZ train young thoroughbred foals following the ten ISES training principles (ISES, 2018). It is proposed that foals educated in a way that aligns with their ethology and cognitive abilities (McGreevy and McLean, 2007) experience improved welfare, have a greater chance of making it to the racetrack and an increased likelihood of a career after racing. Raising and producing young stock for performance-specific equestrian disciplines can be commercially lucrative, particularly horse racing. In 2016–2017, the

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racing industry contributed \$1.6 billion to the NZ economy (Messara, 2018) and in Australia, over \$5 billion (Racing Australia, 2018). The ability to produce individuals that are not only physically sound and well conformed but also mentally prepared for later training is an imperative. Using a training system that uses clear principles of learning and lessens the occurrence of conflict behavior and avoidance and escape behaviors has positive outcomes for both equine and human safety and welfare (McLean and Christensen, 2017). A young horse that has been trained using clear and consistent signals and effective reinforcement will be more compliant, better able to cope with environmental and social changes and consequently safer to handle for example for veterinary examinations and by new owners/trainers (Doherty et al. 2017; Randle, 2010). Within a busy commercial environment, there are inevitable time pressures and purchaser's expectations often resulting in limited time to achieve effective training. Using clear and consistent approaches based on the ten ISES training principles will result in quicker and more robust training, consequently more efficient use of staff time and therefore productivity, and for most organizations, improved commercial viability.

Why are the ISES training principles so important?

The need to use a method that increases both horse welfare and human safety has been increasingly recognized over the past decade (McLean and Christensen, 2017). The advent of Equitation Science has seen the incorporation of learning theory principles into horse training methods (ISES 2018; McGreevy and McLean, 2007) globally (Randle, 2017). The original eight training principles have recently expanded to 10 taking into account the cognition and ethology of the horse and the need for some arousal for learning to take place. The current training principles clearly emphasize the importance of recognizing both the abilities and limitations of the equid brain, consequently the horse's ability to learn new tasks and the potential for confusion. This has led to improved welfare of horses undergoing training (McGreevy and McLean, 2009; Randle, 2016).

Foal NZ trains foals commercially using the ISES training principles to train effectively in a low-stress environment. The New Zealand thoroughbred industry demands expedient and effective foundation training that minimizes stress. Their work is widely recognized within the NZ racing industry. Rodney Schick (personal communication) of Windsor Park Stud refers to the work of Foal NZ as top class stating that the foals they have dealt with are distinguishable from others due to being more confident and relaxed. Similarly former Thoroughbred Breeders President Michael Martin comments that “the Foal NZ education programme gives the foals confidence around people and lays a solid foundation for their whole lives, through weaning, sales preparation, stable life and race day competition, and beyond. This is confirmed by feedback we have received from breakers, trainers, jockeys about our horses”. He also recognizes that the Foal NZ early foal handling process “reduces the likelihood of injuries to horses and people, thus maximizing the opportunity each horse receives to fulfill its racing potential” (Martin, personal communication).

Furthermore, the industry requires the production of young horses that are habituated to humans approaching, haltering, and being touched all over. In addition, it is commonly expected that foals have learned to be led, are able to self-maintain their speed when being led, and are compliant when having their feet picked up by any experienced handler. Over the past 10 years, the New Zealand thoroughbred foals trained by Foal NZ have benefited from an education process that has been refined into one that fully aligns with the ISES training principles (ISES 2018).

Owing to its simplicity and alignment with equine ethology and cognitive abilities, the method used by Foal NZ is readily accessible to stud staff via training also delivered by Foal NZ. The principles that underpin the Foal NZ training approach can easily be described and demonstrated at talks and practical demonstrations to every day horse people/owners/trainers allowing nonracehorses and their owners to benefit. It is particularly important that horses experience consistency and contingency in their learning and training throughout their careers as they progress from foals to weanlings, yearlings to racehorses, and then, ideally to postracing careers ranging from sport horses to leisure horses.

Application of the training principles in foals

The alignment of the methods used in training young thoroughbred foals by Foal NZ with the ten ISES training principles (ISES, 2018) is described in the following:

Training principle 1: take into account the horse's ethology and cognition

Using the understanding of both ethology (the science of animal behavior [Goodwin, 1999]) and cognition (the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses), in addition to the existence of biologically significant critical developmental periods (Brubaker and Udell, 2016), Foal NZ focuses its foal training on the mare-foal bond. All foundation training conducted on the foal is carried out in the presence of the mare. Mares and their foals are kept in paddocks in groups of four to eight during their time at stud (typically up until the foal is 16–20 weeks of age). During training sessions, individual mare-foal dyads are separated from the main herd and located in an adjacent yard (i.e., within sight of their herdmates) to ensure foals receive their initial training in a physical environment that adjoins the natal band. Synchronization of the foal's first, initial training with the early socialization phase of the foal's development (Ladewig et al., 2005) at around 3 weeks of age allows Foal NZ to capitalize on the foal's natural tendency to explore their environment and create new relationships at this time (Henry et al., 2009). Conducting initial training at this foal age also decreases the possibility of training having a negative impact on the mare-foal bond.

To take advantage of the mare's influence on the foal, including under potentially stressful situations, Foal NZ trainers establish positive relationships with the mare during the foal's training session through the use of stroking, scratching and offering salt for the mare to lick. Previously Henry et al. (2005) suggested that positive handling experiences with mares may be transferable to foals for a period of at least 1 year, as evidenced by foals produced by handled mares exhibiting more initiations of interactions with humans, less avoidance and flight responses to humans, and a great acceptance of new situations and application of new equipment such as saddle pads. Foal NZ trainers also allow and encourage mare-foal interaction and communication during the training sessions.

The equine brain has developed to prioritize movement therefore has relatively less cerebral function compared with a human (McBride et al., 2017). Murphy (2009) designed equine Y-maze studies around a maximum attention span of adult horses of 20 minutes, whereas others reported less (Randle, 2008). Foal NZ individual training sessions are typically no longer than 15–20 minutes to allow for the foal's shorter concentration span. Foal training sessions are conducted for no more than three consecutive

days before allowing a foal a rest day in which they are at paddock with their dams and usually other mares and foals.

Training principle 2: use learning theory appropriately

The basic principles of learning theory enable trainers to gain stimulus control of equine subjects. This typically involves the use of classical and operant conditioning and the carefully planned use of reinforcement (negative and/or positive) to increase the likelihood of occurrence of a desired behavior or decrease the likelihood of the occurrence of a undesired behavior. Ethical and effective training relies on the simple relationship between stimulus (cue, signal), response (behavior), and reinforcement (Randle, 2016).

Within the racing industry, foals are likely to be exposed to a wide range of handlers and environments. They therefore need to be able to cope with the presence of the handler and relevant environmental stimuli, such as moving machinery, being stabled if unwell, and going through crushes and yards from an early age. Foals also need to be able to be led and to tolerate physical handling for management, training, and veterinary purposes. Young foals are taught to lead using operant conditioning (stimulus: the simultaneous application of pressure to their hindquarters and poll, response—foal steps forward followed by rapidly applied (negative) reinforcement—removal of pressure). As is often seen within horse training, for example, in trailer loading horses (Hendriksen et al., 2011), a combination of reward is provided through first, the reduction and removal of pressure (negative reinforcement) on the hindquarter and poll closely followed by tactile positive reinforcement (rub on the withers/neck).

Foal NZ also uses the close proximity of the mare to the foal, with the foal possibly learning to move in particular directions when cued, by following the mare. It has yet to be determined whether the apparent learning exhibited by the foal can be attributed to stimulus enhancement followed by individual learning or imitation (Nicol, 1995; Nicol 2002; Murphy and Arkins, 2007). In a recent review of social learning in horses, Rørvang et al. (2018) acknowledge that while horses are sensitive to intraspecies transfer of information, this has yet to satisfy the criteria for social learning. It is therefore unlikely that the mare is providing the stimulus for the foal's behavior, rather that the foal is responding to the signals given by the trainer.

Training principle 3: train easy-to-discriminate cues

Owing to the large number of responses required as outcomes in horse training, it is important that all signals are as clear and as different from each other as possible to enable the horse to discriminate between them. Not using clear and separate signals can lead to confusion and stress and consequently undesired responses that compromise both equine performance and handler safety (ISES, 2018; McLean and Christensen, 2017). Given that a large proportion of young thoroughbreds will be sold at yearling sales, it is important that the stimuli used in early foal training are transferable from practitioner to practitioner and likewise handler to handler. In the thoroughbred racing industry, horses typically live in a minimum of three environments and potentially far more; initially bred at a stud or private facility, they then move to a pre-training/training facility, and often continue to a postracing home. They may also be trained by different personnel during their racing careers. Within each environment, the education and experience of staff is variable as there is currently no industry required prerequisite in either for commencing work with equines.

Foal NZ determined which behavioral goals would be trained in foal training following a determination of the most common behaviors/responses requested by the staff working in the thoroughbred racing industry. This industry has a specific need for

yearlings to be able to perform a fixed range of behaviors when shown for sale in the national yearling sales, including to walk forward with the handler at the horses' shoulders and to stand quietly on command. Foals are therefore trained using signals that are easy to discriminate from the beginning of their early training. The "go" response is signaled by pressure simultaneously on the hindquarters and poll and chin through forward pressure on the lead rope and halter (Figure). "Stop" is signaled by pressure across the nose via the halter and lead rope. A left movement with the handler's hand (i.e., without applying pressure) signals a left turn of the foal's whole body and a right movement with the handler's hand signals a right turn of the foal's whole body.

Training principle 4: shape responses or movements

Shaping is a learning process that involves reinforcing behaviors that become progressively closer to the intended behavior as training progresses. Shaping involves a number of successive approximations, that is, responses that with iteration become increasingly similar to the desired response, that are reinforced (Pearson, 2015). Care is needed to enhance progress by not overly rewarding a particular approximation, making it difficult to progress to the intended entire response.

Shaping is an essential training tool used by Foal NZ due to its proven efficacy (see the study by Pearson, 2015 for summary of the successful use of shaping in veterinary procedures), and all responses are trained using shaping. In particular, teaching the foal to pick up its feet uses shaping; initially the foal is habituated to human touch on its legs and feet, followed by short repetitive lifts with the handler supporting the foal as it learns to balance. Reinforcement occurs when the handler physically releases the leg and allows the foal to stand on four legs and rest briefly. This is followed by lifting the foot for longer durations of up to 10 seconds with gradual decreasing of the physical support provided by the handler. The foal is deemed "trained" when he/she is capable of picking up a foot on request, rebalancing its other feet so it can maintain a standing position, and continuing to maintain its balance and its foot off the ground until the farrier has completed the trimming process.

Training principle 5: elicit responses one at a time

Giving the horse multiple signals at the same time can result in a reduction in responding of any required behavior as the horse is unable to process two or more signals concurrently (ISES, 2018). Foal NZ training methods ensure that individual cues/signals are clearly separated in time from each other. With horses likely to experience multiple handlers with differing handling abilities over the course of their career (as a racehorse and beyond), it is imperative that Foal NZ training is implemented in a clear, effective manner to improve the chances of individual horses being able to demonstrate the correct response to each cue/signal.

An example of eliciting responses one at a time is when seeking the "stop" response followed by the "go" response. Initially the "stop" signal/cue is applied by placing pressure on the nose of the foal through the lead rope via the halter. Once the foals' feet have become stationary, and the pressure removed, the subsequent cue is applied for "go"—a forward movement with the hand under the foals chin applying pressure on the chin and poll through the halter. It is imperative that the pressure for "go" is not applied until the "stop" response is completed (as evidenced by the foal's feet all being stationary). Without this temporal separation, the two cues will become associated and lose their independence of, and distinction between, each other.



Figure. The “go” response is signaled by pressure simultaneously on the poll and chin through forward pressure on the lead rope and halter. Images show before giving the “go” cue (top), giving the “go” cue (middle), and releasing the cue (bottom). Foal NZ—Leigh Wills (2018).

Training principle 6: train only one response per signal

Only one response is trained per signal and the amount of signals trained is minimized. It is known that equids respond well in situations where signals and outcomes are predictable and controllable (ISES, 2018). Not surprisingly then, if a specific signal is used to elicit more than one response, the horse is likely to experience confusion as predictability of the outcome of a specific signal decreases.

However, it is particularly important that the thoroughbred racehorse is able to retain understanding of a specific signal within different contexts, as they are likely to be required to perform in a consistent manner but with different handlers in different environments in differing states of arousal throughout their career. The “go” response is arguably the most pertinent response of a

thoroughbred racehorse, and although the horse will likely experience a variety of signals that request the “go” response during their career (including pressure on the chin and poll through the lead rope and halter, pressure of the riders legs when under saddle, change of weight distribution from the rider, and opening of the starting gates), Foal NZ ensures that when training the “go” response, only one response is trained per signal, and a minimal amount of signals are used during the foals’ foundation education.

Training principle 7: form consistent habits

When training new responses, it is important that the same signals are used on the same part of the horse’s body and that all contextual aspects such as place, equipment, and person are kept as

constant as possible. This is because during the acquisition of new responses, all contextual information is initially included in the array of stimuli associated with the particular response, and maintaining consistency promotes efficient uptake of the associated cue and avoids excessive stress of prolonged training (ISES, 2018).

To train foals efficiently, Foal NZ trainers ensure that signals are consistently placed on the same part of the foals' body, and that each response is consolidated before the new context is added. For example, the foal will learn to stand and accept being approached and touched in a small yard until the correct response is consolidated (evidenced by the foal remaining still and attentive for a minimum of two minutes), at which point the environment will be changed by moving into an adjacent larger yard, when the same cue/signal (handler approaching the near side shoulder) will be given again.

Training principle 8: train persistence of responses

Being able to achieve persistence of responding is important in equine training and practice as it means that the continuous issuing of signals to maintain a response is not required. This can become repetitive and the recipient can quickly become habituated to the signal, resulting in a dulled response (practically known as “dull to the aids”) in which further signals of increasing intensity are required to achieve the same original required response.

Foal NZ trains foals to continue their locomotory responses after a movement cue has been given until they receive a different cue signaling a different response. This approach allows foals to receive only minimal cues/signals and consequently reduces the risk of the foal stopping its response to the signals. Foals are initially trained to “go” alongside the mare, which is also moving in synchronicity. The natural walking rhythm of the mare is matched by the Foal NZ handler, and this rhythm is in turn reflected in the foal. The footfalls of the foal and handler are often observed to match. By using the mare to “set the pace,” this also scaffolds the desirable foal behavior, that of maintaining the movement/self-carriage, until a further cue/signal is given for a different behavior.

Training principle 9: avoid and disassociate flight responses

Flight responses tend to be difficult or even impossible to remove and may reappear spontaneously. Training processes that involve systematic/deliberate triggering of fear responses should be avoided because fear inhibits learning and reduces equine welfare (ISES, 2018). The environment a racehorse performs in is likely to create stress given its public nature (crowds of people, loudspeaker, anticipatory behavior). Given the increased stress the racehorse may experience in this environment, it is important that they are trained in a way that inhibits their flight response.

To avoid and/or inhibit the flight response while training foals, Foal NZ minimizes the size of the initial training area, contain the foal between the mare and the handler, and place soft protective padding on the fencing. As the training progresses, the environment size is increased; however, if any signs of stress are shown by the foal, the area in which training takes place is decreased in size until the foal is performing consistently again.

Training principle 10: demonstrate minimal levels of arousal sufficient for training

Trainers should be able to demonstrate that the horse is as relaxed as possible during training. While it is widely agreed that certain levels of physical and mental arousal (e.g. muscle tone and attentiveness) are necessary for learning to take place, it is important that these levels are not exceeded resulting in a negative impact on learning, training, and horse welfare (ISES, 2018). There is

a fine balance to be reached regarding the levels of arousal needed for effective training to occur; insufficient arousal may result in lack of motivation for learning, whereas excessive arousal may lead to short-term stress-related responses such as flight and aggression, impaired ability to interact with trainers and engage in learning (Valenchon et al., 2013), and long-term effects such as the development of learned helplessness (Hall et al., 2008; Randle, 2008).

Foal NZ places high importance on recognizing the signs of individual foals experiencing “stress” and individual stress responses, and being able to act accordingly to reduce their levels of arousal to an appropriate level at which learning is possible (Hall et al., 2018). Methods of doing so include minimizing the size of the training area (as described previously), pausing the training to allow the foal to relax next to their dam, offering the foal a salt block to lick (creating physical facial and jaw relaxation and by association potentially mental relaxation) or by simply returning to an already established behavior instead of asking for advancement. The mare is an important part of the foal's physical and social environment, therefore management of her stress levels and responses is also a crucial part of the training process, and only when this is conducted successfully are the Foal NZ handlers able to achieve a successful training session with the foal.

Application in industry

Training foals and other equids using the ten ISES training principles leads to diminished risk of injury to both handlers and horses, and improved equine welfare. If these fundamental training principles were to be applied more widely throughout the racing industry, then it is likely that training horses in these commercial, pressured environments would become clearer and easier with greatly improved outcomes regarding both horse and human health and safety, and horse performance.

The New Zealand thoroughbred industry is one of the most successful in the world. In 2015–16, the industry produced 3500 foals and exported 1700 horses at an estimated value of \$138 million. It sustains more than 14,000 full-time equivalent jobs, has over 55,000 participants and generates more than \$1.6 billion in value-added contribution to the New Zealand economy. The thoroughbred code, alone, has 16,000 owners, 3700 breeders, and 1000 trainers and generates more than 9000 full-time equivalent jobs, plus volunteers (Messara, 2018). Given its size and reach, never mind its monetary value, the New Zealand thoroughbred racing industry should be seen as a leader in terms of animal welfare. It therefore has a responsibility to meet the requirements of improved animal welfare, particularly given the public's ongoing concern over the welfare of animals used in sport. Increased funding for research and a heightened awareness of the life of horses after their racing career creates more focus on the horseracing industry. By investing in evidence-based ethical training for foals, the thoroughbred racehorse industry would begin a process that, should this training continue through the foal's lifespan, allow for greatly increased welfare. Such a proactive approach accords with increasing public desire for welfare prioritization in the racing industry.

Application in nonracing horse populations

The evidence-based ethical training methods used by Foal NZ hold an equally valid place within the training and management of other horses including the sizable leisure horse population. In comparison with working within the commercial thoroughbred industry, many sport horse owners are not professional horse trainers and may have limited knowledge of training methods. Using the ten ISES training principles when educating their horses' from foal hood and throughout their horse's working life has the

potential to allow for greater animal welfare and ease of handling for those professionals that are part of the sport horses lives such as veterinarians and farriers.

Next steps for Foal NZ

Foal NZ is closely involved with academic developments and continually seeks objective information for continuing to enhance the training methods used. At the current time, the scheduling of foal training sessions is being reviewed to take into account recent preliminary research findings and to facilitate even alignment with foals' biological development. While training outcomes data indicate complete success, the perusal of further enhancements to promote ethical foal training attests to Foal NZs drive to provide wholly evidence-based equine education.

Recent research by Schomber et al. (2018) has indicated that riding horses learn and recall novel tasks as well if they are trained once in every 3 days as if they are subject to training every day. Foal NZ already use objective behavioral observations of foal behavior and performance during training sessions and relate these to stress-related responses to training, learning ability, and responses to stimuli (König von Borstel et al., 2017; Waran and Randle, 2017) and how this differs according to foal age (Brubaker and Udell, 2016) and will conduct objective investigation in this area with a view to providing best practice foal handling.

Summary

Foal NZ has developed and refined a young horse handling and training process whereby New Zealand thoroughbred foals, at the beginning of their career as racehorses, can be trained using the evidence-based principles of learning theory. Training young horses using clear, consistent signals that take into account the foal's ethology and cognitive ability allows these horses to experience improved welfare, have higher chances of making it to the racetrack, and an increased likelihood of a career after racing. Working within a system that utilizes clear training principles and lessens conflict behavior increases staff safety and wellbeing, improves efficiency and productivity, leading to improved economics in a commercial and extremely competitive breeding environment. Foals educated using this process are also more compliant and able to cope with veterinary examinations and other management and health maintenance—related procedures such as foot care, vaccinations, and grooming.

Commercial breeders can learn and apply the ten ISES principles to their management systems as Foal NZ provide a range of talks and practical demonstrations tailored to the individual environment and ethos of the equine organization. Foal NZ also teaches evidence-based ethical training methods to trainee jockeys and staff through industry training courses in New Zealand.

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Conflict of interest

There are no competing interests although two of the authors are part of Foal NZ. This article simply reports on methods used.

Disclosure statement

The practical outcomes being reported in this article derive from work undertaken by Foal NZ within the Equine Industry. Sally King, is a Director of Foal NZ. Leigh Wills, is also a Director and is the Founder of Foal NZ. These authors and practitioners have developed a training process, based on the ISES Training Principles, for the education of young Thoroughbred foals. Associate Professor Hayley Randle is an academic at Charles Sturt University and does not work for, or benefit from monetary gain, from Foal NZ. Hayley Randle has been on ISES Council since the Society's inception in 2007, and undertook ISES Vice President roles from 2011–2017. The work undertaken by Foal NZ is reported in this In Brief: Practice and Procedure paper, as it is aimed at forging links between the academic and practitioner communities, whereby academic based Principles of Training are used to improve young racehorse education and welfare.

No actual data are reported.

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