



Equitation Science: A Research-based Approach to Improved Understanding of Horse Perspective

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66th EAAP Meeting

Warsaw, Poland

Overview of Presentation

- What is Equitation Science?
- Introduction to current and ongoing equitation science research
- Incorporation of equitation science into practice and industry

What are we learning about horses' responses to management, training methods and equipment, and about equine temperament, and affective state?



Equitation

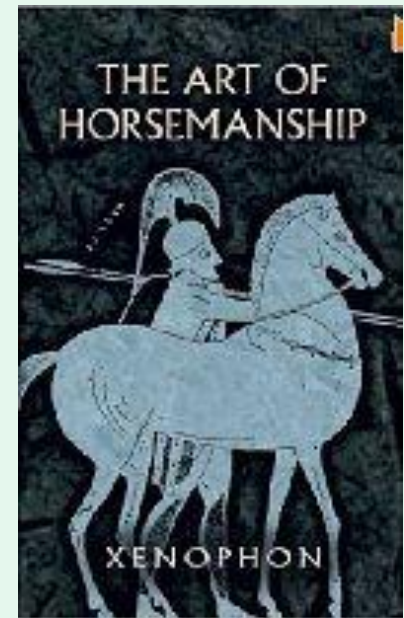
- **Equitation** is the art or practice of horse riding or horsemanship. More specifically, **equitation** may refer to a rider's position while mounted, and encompasses a rider's ability to ride correctly and with effective aids. In horse show competition, the rider, rather than the horse is evaluated. - *Wikipedia*



Photo courtesy of Australian Equine Behaviour Centre

Xenophon: The Father of Classical Equitation

- Wrote the first fully preserved manual on the riding horse
 - “The Art of Horsemanship”
- Urged readers to know the horse’s “psyche,” its mentality.
- Writings stress the importance of horse care and handling, and understanding the horse



Source: International Museum of the Horse

What is Equitation Science?

- The application of objective research and advanced practice to training and riding of horses
 - To improve the welfare of horses in their associations with humans
- Includes learning theory, ethology & cognition, biomechanics, psychology & sport science.



Equitation Science Research: Horse Perspective





Motivation for hay: Effects of a pelleted diet on behavior and physiology of horses

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ARTICLE INFO

Article history:

Received 3 September 2010

Received in revised form 15 September 2010

Accepted 16 September 2010

Keywords:

Horse

Diet

Operant conditioning

Fiber

Hay

Motivation

Fecal pH

Time budget

ABSTRACT

The natural diet of free-ranging horses is grass, which is typically high in fiber and calorically dilute, however diets for high performance domestic horses are often low in fiber and calorically dense. The aim of the study was to determine the motivation of horses for hay when fed a low roughage diet. Their motivation could be used to determine if low roughage diets compromise the welfare of horses. Eight mares were fed two different diets in counterbalanced order: *ad libitum* orchard grass hay; a complete pelleted feed (pellets). Each trial lasted three weeks, with a one-week transition period between diets. To determine the motivation of horses for fiber they were taught to press a panel to obtain a food reward. The fixed ratio (FR) was increased using a progressive ratio ((1,2,4,7,11...)) technique. When fed pellets, the horses worked for a median FR of 1 (Range = 1–497) to attain pellets, and when fed hay, they worked for a median FR of 25.5 (4–497) to attain pellets. When fed hay, the horses worked for a median FR of 0 (0–0) to attain hay, and when fed pellets, they worked for a FR of 13 (2–79) to attain hay. These results indicate a greater motivation for hay, a high fiber diet, when fed a low fiber diet. The horses spent 10 (5–19.4)% of their time during a 24-hour period eating pellets compared to 61.5 (29–76) % of their time eating hay. Horses spent 58% of their time standing when fed the pellets and only 37% of their time standing when fed hay. Searching behavior (i.e. sifting through wood shaving bedding for food particles) took up 11.5 (1.4–32) % of the horse's day when fed pellets, but only 1.2 (0–3.5) % of the daily time budget when fed hay. Horses chew more times when eating a hay diet (43,476 chews/day) than when eating a pellet diet (10,036 chews/day). Fecal pH was lower in horses fed the pelleted diet.



RESEARCH

Trailer-loading of horses: Is there a difference between positive and negative reinforcement concerning effectiveness and stress-related signs?

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KEYWORDS:

negative reinforcement;
positive reinforcement;
horse;
behavior;
heart rate;
trailer-loading

Abstract The traditional way to train horses is by the application of negative reinforcement (NR). In the past few years, however, the use of positive reinforcement (PR) has become more common. To evaluate the effectiveness and the possible stressor effect of the 2 training methods, 12 horses showing severe trailer-loading problems were selected and exposed to trailer-loading. They were randomly assigned to one of the 2 methods. NR consisted of various degrees of pressure (lead rope pulling, whip tapping). Pressure was removed as soon as the horse complied. PR horses were exposed to clicker training and taught to follow a target into the trailer. Heart rate (HR) was recorded every 5 seconds and behavior denoting discomfort was observed using one-zero sampling with 10 seconds sampling intervals. Training was completed when the horse could enter the trailer upon a signal, or was terminated after a maximum of 15 sessions. Of the 12 horses, 10 reached the criterion within the 15 sessions. One horse was eliminated from the study because of illness and 1 PR horse failed to enter the trailer. A Mann–Whitney *U*-test indicated that the horses trained with NR displayed significantly more discomfort behavior per training session than horses trained with PR (NR: 13.26 ± 3.25 ; PR: 3.17 ± 8.93 , $P < 0.0001$) and that horses in the PR group spent less time (second) per session to complete the training criterion (NR: 672.9 ± 247.12 ; PR: 539.81 ± 166.37 , $P < 0.01$). A Mann–Whitney *U*-test showed that no difference existed in mean HR (bpm) between the 2 groups (NR: 53.06 ± 11.73 bpm; PR: 55.54 ± 6.7 bpm, $P > 0.05$), but a Wilcoxon test showed a difference in the PR group between the baseline of HR and mean HR obtained during training sessions (baseline PR: 43 ± 8.83 bpm; PR: 55.54 ± 6.7 bpm, $P < 0.05$). In conclusion, the PR group provided the fastest training solution and expressed less stress response. Thus, the PR procedure could provide a preferable training solution when training horses in potentially stressing situations.

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Contents lists available at [ScienceDirect](#)

The Veterinary Journal

journal homepage: www.elsevier.com/locate/tvjl



Force and pressure distribution beneath a conventional dressage saddle and a treeless dressage saddle with panels

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ARTICLE INFO

Article history:

Accepted 30 September 2013

Keywords:

Rider
Equestrian
Training
Saddle

ABSTRACT

The objective of this study was to compare forces and pressure profiles beneath a conventional dressage saddle with a beechwood spring tree and a treeless dressage saddle without a rigid internal support and incorporating large panels and a gullet. The null hypothesis was that there is no difference in the force and pressure variables for the two saddles. Six horses were ridden by the same rider using the conventional dressage saddle and the treeless dressage saddle in random order and pressure data were recorded using an electronic pressure mat as the horses trotted in a straight line. The data strings were divided into strides with ten strides analyzed per horse–saddle combination. Variables describing the loaded area, total force, force distribution and pressure distribution were calculated and compared between saddles using a three-factor ANOVA ($P < 0.05$).

Contact area and force variables did not differ between saddles but maximal pressure, mean pressure and area with pressure >11 kPa were higher for the treeless dressage saddle. The panels of the treeless dressage saddle provided contact area and force distribution comparable to a conventional treed saddle but high pressure areas were a consequence of a narrow gullet and highly-sloped panels. It was concluded that, even with a treeless saddle, the size, shape, angulation, and position of the panels must fit the individual horse.



Contents lists available at SciVerse ScienceDirect

Journal of Veterinary Behavior

journal homepage: www.journalvetbehavior.com

Short Communication

A note on the force of whip impacts delivered by jockeys using forehand and backhand strikes

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ARTICLE INFO

Article history:

Received 28 August 2012

Received in revised form

28 March 2013

Accepted 29 March 2013

Available online 28 May 2013

Keywords:

horse

welfare

whip

pressure detection

laterality

forehand

backhand

ABSTRACT

The Australian Racing Board makes a distinction under its Rules of Racing concerning whip use between forehand and backhand whip action that is critically important: before the final 100 m of a race, the whip shall be used in a forehand manner neither in consecutive strides nor on more than 5 occasions. This seems to imply that backhand whip use is less closely scrutinized, which may have profound implications for horse welfare. We used pressure-detection pads to examine the force on the impact of 288 whip strikes (left forehand, left backhand, right forehand, and right backhand; $n = 72$ each) in batches of 12 consecutive strikes by 6 right-handed jockeys based in Victoria, a state in which thoroughbred racing is always conducted in a counterclockwise direction. The mean latency (\pm standard error of the mean) to complete each series of 12 strikes was 6.89 ± 0.44 seconds. The mean for force was 46.90 ± 5.39 N. Significant differences in force emerged between individual jockeys and in most interactions between jockey, hand and action. This highlights the problems the industry has in trying to enforce equity in whip use to satisfy punters while at the same time giving reassurances about horse welfare. The current results show that action (forehand vs. backhand) does not influence force on impact when using the nondominant hand. However, when using the dominant hand, these jockeys struck with more force in the backhand ($P = 0.02$). This result challenges the current focus on welfare concerns around forehand whip strikes. It should inform any review of the rules around whip use because it may help to avoid any unjustified focus on either forehand whip use or backhand whip use. This would help to inform the debate around levels of impact on fatigued horses when they are being struck for a perceived sporting gain.



ELSEVIER

REVIEW

Assessment of ridden horse behavior

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KEYWORDS:

horse;
equitation;
ridden behavior;
equestrian

Abstract Assessments of the behavior of ridden horses form the basis of performance evaluation. The purpose of any performance being evaluated will determine the factors considered important, factors indicative of “poor” performance, and what makes a successful equine athlete. Currently, there is no consistent objective means of assessing ridden horse behavior, and inevitably, given the different equestrian disciplines, the likelihood of a universal standard of good and bad performance is remote. Nevertheless, to protect the welfare of the ridden horse regardless of its specific role, we should strive for consensus on an objective means of identifying behavioral signs indicative of mental state. Current technological developments enable objective evaluation of movement patterns, but many aspects of the assessment of ridden behavior still rely on subjective judgment. The development of a list of behaviors exhibited by ridden horses, a ridden horse ethogram, will facilitate recording of observable behavioral events. However, without objective evidence of the relevance of these behavioral events, such a resource has limited value. The aim of this review was to investigate potential sources of such evidence and relate these to the assessment of ridden horse behavior. The current and potential contribution that further objective measures can make in this process is evaluated. We believe that the only way to improve the welfare of the ridden horse is by objectively identifying behavioral signs that indicate that the horse is either comfortable or uncomfortable with the activity in which it is participating. After there is clear evidence to support this, appropriate adaptation of performance criteria in all disciplines can proceed along with alignment in training systems that ensures a mutually positive experience for both horse and human partners.

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Contents lists available at ScienceDirect

Applied Animal Behaviour Science

journal homepage: www.elsevier.com/locate/applanim

Behaviour of horses in a judgment bias test associated with positive or negative reinforcement

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ARTICLE INFO

Article history:

Accepted 13 June 2014

Available online 20 June 2014

Keywords:

Cognitive bias

Equus caballus

Emotions

Optimism


Training method

ABSTRACT

Moods can influence our judgment of ambiguous stimuli as positive or negative. Measuring judgment bias in animals is a promising method to objectively assess their emotional states. Our study aimed to develop a cognitive bias test in horses, in order to assess the effect of training using positive reinforcement (PR) or negative reinforcement (NR) on their emotional states. We trained 12 mares to discriminate between a rewarded and a non-rewarded location situated on each side of a paddock. The mares were then trained during five days to perform several exercises using PR ($n = 6$) for one group, and NR ($n = 6$) for the other (treatment). Finally, we compared the responses of the two groups to three ambiguous locations situated between the rewarded and non-rewarded locations (judgment bias test). During the training exercises, according to our predictions, behavioural measures suggested that NR mares experienced more negative emotions than PR mares. Surprisingly, the results of the judgment bias test suggest that NR mares were in a more optimistic mood compared to PR mares, despite previously experiencing more negative emotions during the treatment. NR mares could have been more motivated to obtain a food reward than PR mares, which had been rewarded throughout the treatment phase. Alternatively, NR mares could have developed optimistic bias triggered by release from the negative state experienced during treatment. This first attempt to test judgment bias in horses suggests that this is a promising method to measure horse mood. Knowledge about the effect of training methods on the mental health of domesticated animals can add a new dimension to animal welfare, in order to promote better ways to work with animals.

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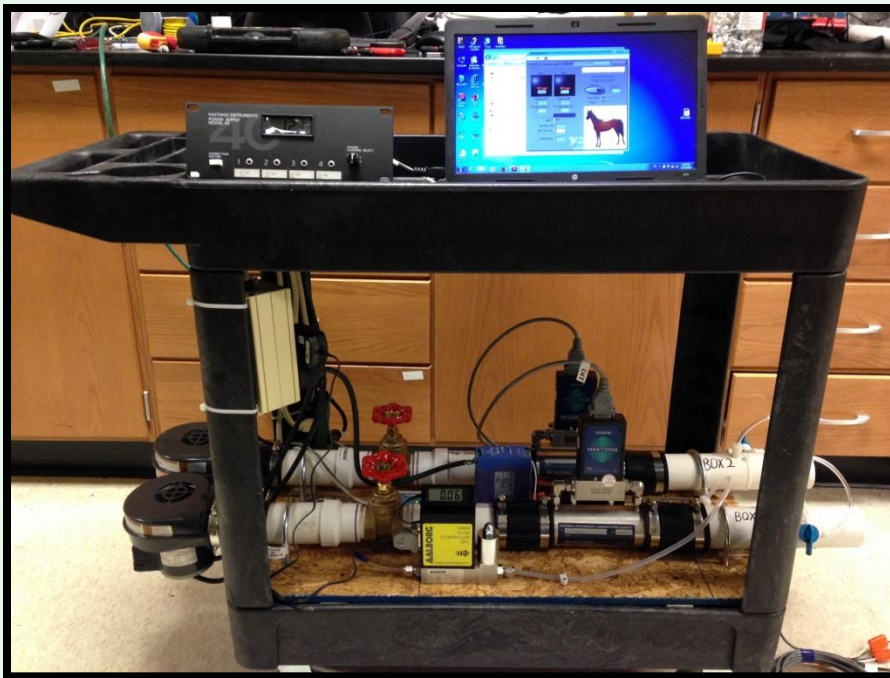
Investigating the Impact of Ammonia on the Behavior and Physiology of Horses

- Crude protein often fed in excess
 -  urinary N excretion
 - Rapidly volatilized to ammonia (NH₃)
- NH₃ is the most important gas in the stable environment with respect to animal health
 - Chronic and acute respiratory disease
- Concentration of NH₃ that is harmful to horses has not been determined
 - In humans, short-term exposure is limited to 35 ppm (ATSDR, 2004)

Objective

Develop methodology to investigate the effects of NH_3 concentrations on horse behavior and welfare

Head Box System



Air supply control and data acquisition system



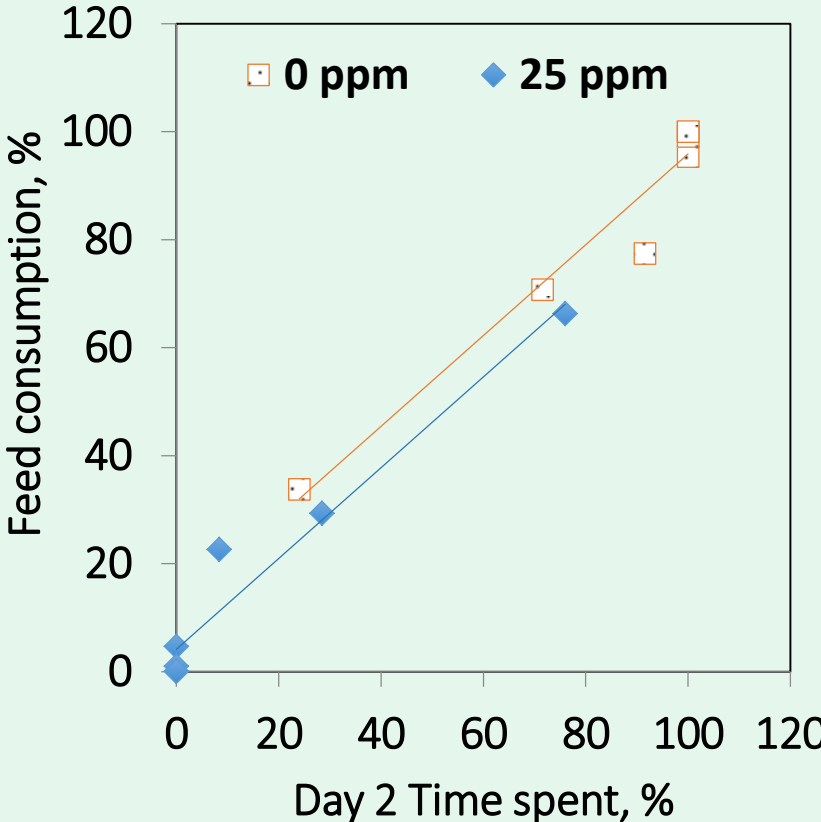
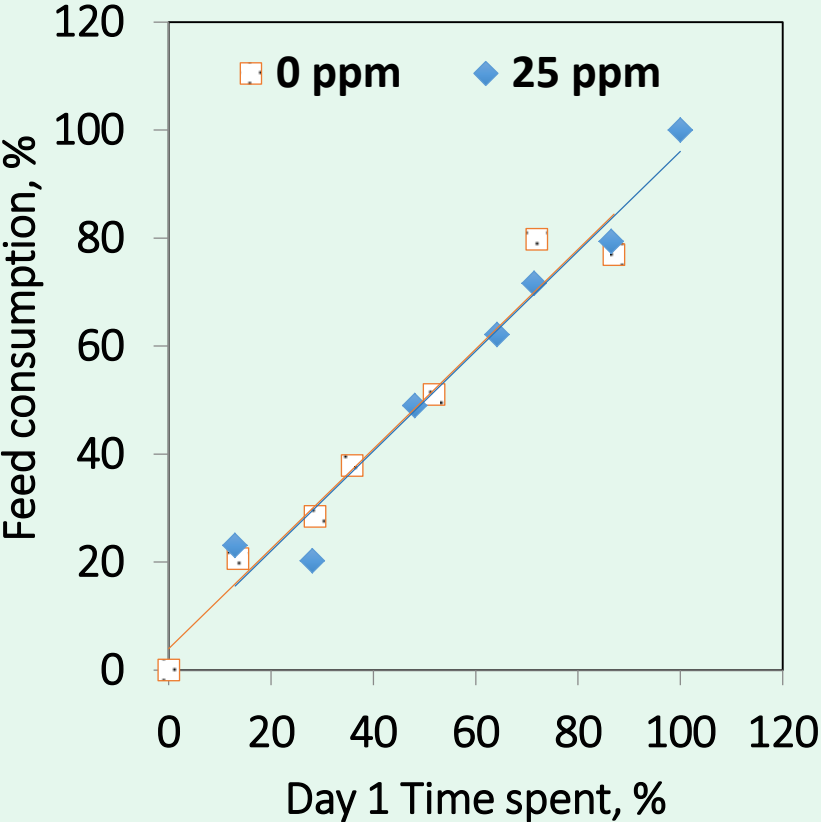
Head boxes

Pilot Study: Experimental Design

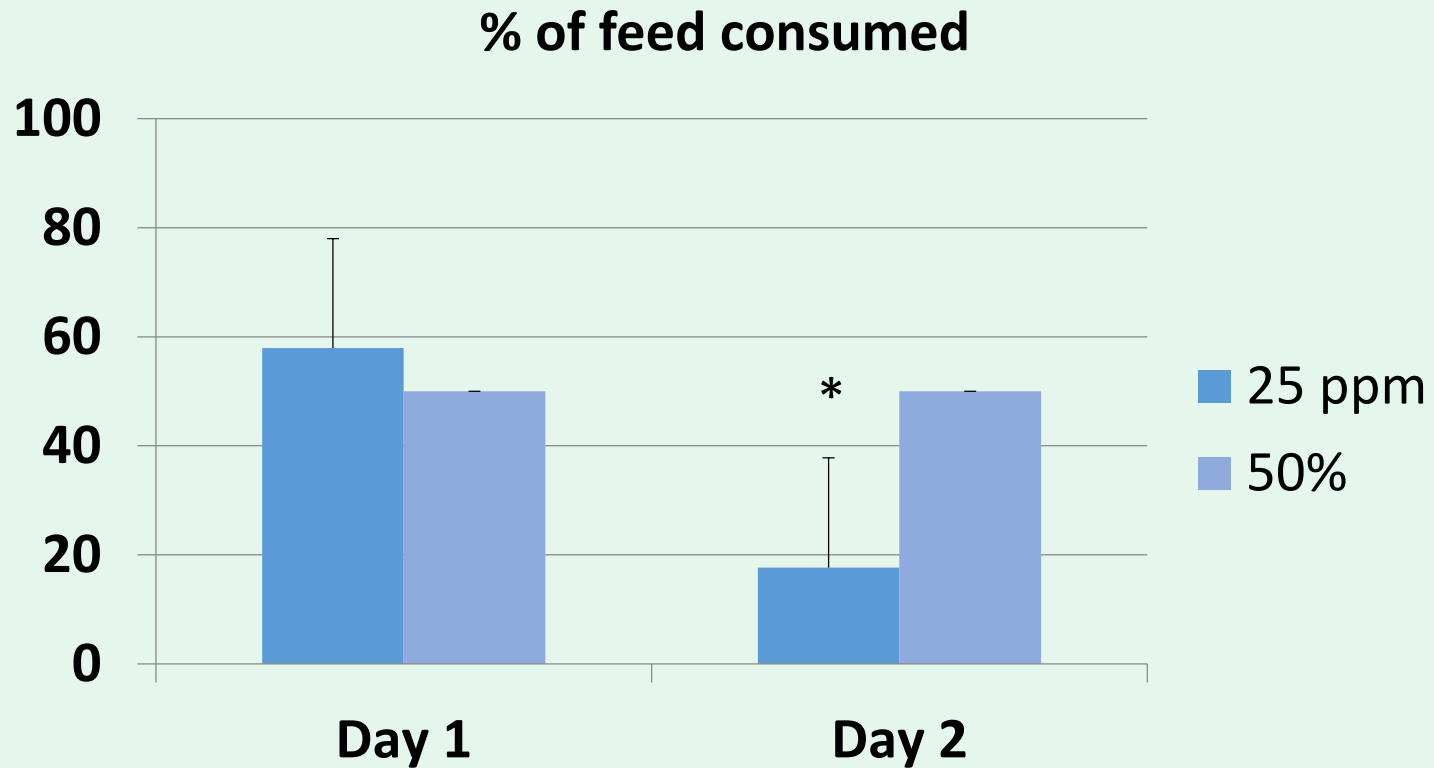
- 7 adult horses (4 geldings and 3 mares)
 - Two-choice test: 0 vs. 25 ppm NH_3
 - Following acclimation period
 - 10 minute trials
- Initial head box selection, feed consumption, and time spent feeding were measured
- Trials were video recorded
 - To begin deriving behavioral measures
 - Possible indicators of aversion



Relationship Between NH_3 Concentration and Feed Consumption



Percentage of Feed Consumed from 25ppm Head Box Compared to 50%



*** $p = 0.006$**

Conclusions

- Horses show aversion to NH_3 filled air
 - More time spent feeding and greater feed consumption in 0 ppm
- High NH_3 concentrations
 - Potential discomfort and distress for horses
- The head box system shows promise as a research tool for investigating the effects of air quality on horse behavior and welfare

Future Directions

- Two-choice preference test
 - Randomized, crossover design
 - 0 vs. 25 ppm, 0 vs. 50 ppm, and 25 vs. 50 ppm
 - Naïve to stabling
- 10-minute trials across AM and PM feedings to eliminate directional bias
 - Followed by a short washout period
- Behavioral and physiological indicators will be measured



Tests for Temperament and Personality

- For the welfare of both horse and rider we should aim for matching personality with:
 - Rider
 - Goal and use
- Need for objective assessment of horse personalities and temperament
- Several groups have developed tests and some studbooks are using them in the selection for sports and breeding

Umbrella Test Revealed 4 Types of Temperament:



Fleeing

Focussing



Standstill



Not focussing



There's More to Come...

- Is it possible to judge if a horse is a happy athlete? – Waran
- When I look into your eyes...what eye wrinkles in horses tell us about their emotional state – Hintze et al.
- The effect of martingale attachments on rein tension in the ridden horse – Randle and O'Neill
- Automated stress monitoring and suitability assessment in candidate police horses – Piette et al.

Strategies for Incorporating Equitation Science into Practice

Conferences

- Equitation Science conferences have been held in:

- Vancouver, Canada 2015
- Denmark 2014
- Delaware, USA 2013
- Edinburgh 2012
- Netherlands 2011
- Sweden 2010
- Sydney 2009
- Dublin 2008
- Michigan, USA 2007
- Italy, 2006
- Australia, 2005

Ethical equitation for all equestrian disciplines – Breaking barriers and building bridges

Equine stress, learning, and training

Embracing science to enhance equine welfare and horse-human interactions

Educational Resources and Guidelines for Best Practices

- Code of Conduct
 - Developed in partnership with World Dressage Masters
- 10 Principles in Training
- Position Statements
 - Restrictive nosebands
 - Use of aversive stimuli in horse training
 - Head and neck posture in equitation
- Articles and media releases through popular press and industry publications

FIRST PRINCIPLES



OF HORSE TRAINING

International Society for Equitation Science

These principles are essential for optimal welfare and training efficiency. They apply to all horses regardless of age, breed, training level and equestrian discipline. Does your training system demonstrate each principle?

Train according to your horse's ethology and cognition

Horses have evolved to live and process information about the world in a certain way

- ✓ They need the company of other horses, movement and virtually continuous eating
- ✗ Take care about blaming them for past behaviours as they may not recall events like humans do

Train easy-to-discriminate cues

- ✓ Each cue should be unique
- ✓ Cues for each response should be clearly separate (particularly acceleration and deceleration)
- ✓ This relates to all rein and leg pressures, as well as voice, seat and posture cues

Elicit responses one-at-a-time

- ✓ Ask for one thing at a time
- ✓ Time cues so they elicit the correct limb movement
- ✓ Cues can be closer as responses are consolidated
- ✗ Simultaneous or clashing cues inhibit each other and gradually he will desensitise to your cues

Form consistent habits

When training new responses, always:

- ✓ Maintain the same context / environment (it can be gradually altered once responses are consolidated)
- ✓ Use the same cues in the same place on his body or relative to his body
- ✓ Shape transitions so they are the same structure and duration each and every time

Use learning theory appropriately

Learning theory describes the processes by which horses learn.

Your learning theory toolkit includes:

Habituation

Use habituation techniques to help him become accustomed to events and stimuli and no longer react.

- ✓ Habituation techniques include progressive desensitisation, overshadowing, stimulus blending, counter conditioning and approach conditioning.

Classical conditioning

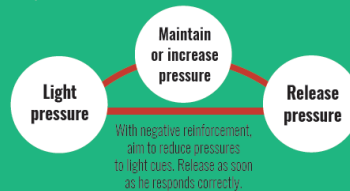
Using cues to trigger and elicit behaviours. When training cues your timing needs to be precise to coincide with the start of the desired behaviour.

- ✓ Classically conditioned cues include, seat, voice, posture and gestures.

Operant conditioning

The use of rewards and consequences.

- ✓ Use both positive and negative reinforcement. When used correctly these forms of operant conditioning are ethical and effective.
- ✓ Timing is everything. Aim to quickly reduce any pressure-based cues to light forms of pressure.
- ✗ For optimal welfare you should avoid punishment.



Shape responses and movements

- ✓ First reinforce a basic attempt at the target behaviour
- ✓ Then aim to improve the behaviour in a step-by-step way

Demonstrate minimum levels of arousal sufficient for training

- ✓ He should be as calm as possible during training
- ✗ When certain levels of arousal are exceeded learning and welfare suffer

Train persistence of responses (self-carriage)

- ✓ He should maintain rhythm, straightness and outline without the need for constant cueing
- ✗ Constant cueing ('nagging' or 'motivating') can lead him to habituate to your cues

Train only one response per signal

- ✓ Each cue should elicit a single response
- ✓ Rein cues, which relate to deceleration and turning, are clearly separate from leg cues, which relate to acceleration
- ✗ He can't differentiate leg and rein cues which are used for a multitude of responses

Avoid and dissociate flight responses

- ✓ Avoid flight response behaviours at all costs

Did you know? Flight response behaviours resist extinction, may reappear spontaneously, and are often accompanied by many physical and behaviour problems. They can result in acute and chronic stress.

This is a brief overview of the horse training principles. It has been simplified for ease of use. It may be printed in its exact form for public display. You can find a more complete description of each principle on the ISES website. Visit:

www.equitationsscience.com

The 10 Principles of Training



ISES position statement on alterations of the horses' head and neck posture in equitation

Background

Horses have long mobile necks that evolved to facilitate efficient feeding and drinking. In many horse sports head and neck posture resulting from the relative positioning of the cervical (neck) vertebrae and the atlanto-occipital joint (the poll) is given high priority and is typically manipulated via rein tension (see Figure 1). It is common to see the horse's neck either extremely flexed (see Figure 1c) or extended (see Figure 1d) in a wide range of disciplines including (but not limited to) cross country, dressage, driving, reining and showjumping. In many cases, these positions cannot be self-maintained by the horse either at all or for any length of time. There is substantial evidence that head and neck postures such as these have a negative impact on horse welfare.

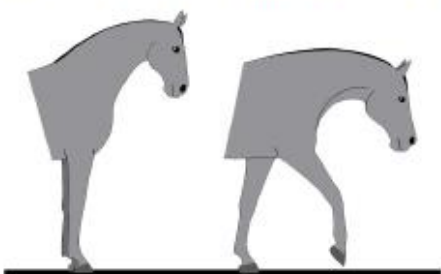


Fig 1a. HNP 'in front of the vertical'

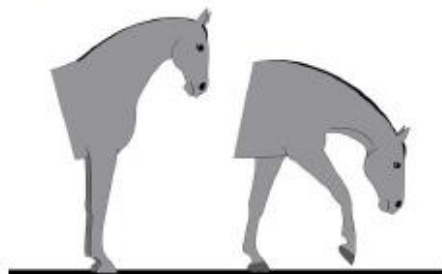


Fig 1b. HNP 'on the vertical'

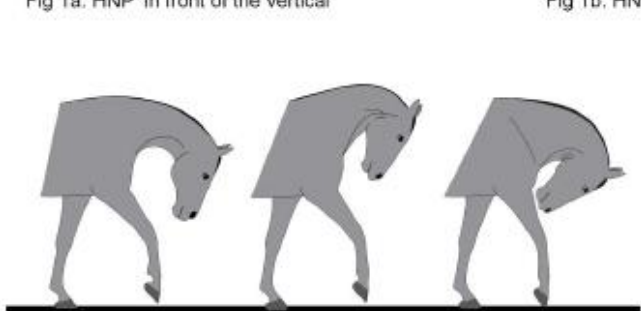


Fig 1c. HNP 'behind the vertical'



Fig 1d. HNP 'inverted'

Figure 1a-d: Head and neck postures (HNP) with different dorso-ventral flexions. Illustrations by Cristina Wilkins, courtesy of [ISES](https://www.ises.org/).

Position Statement on Head and Neck Posture

Workshops and Clinics



- Equitation Science workshop- 2015 Equine Science Society Symposium



- Training for veterinary students



- Training for mounted police units

Examples of Application in Veterinary Medicine and Behavior Modification



Videos courtesy of Gemma Pearson and Angelo Telatin

In Summary



- The field of equitation science has grown substantially during the past decade
- Research conducted is going a long way to better inform equine management and training practices and to promote the sustainability of equestrian sport
- There is continued need to disseminate equitation science research in order to assure implementation of best practices



International Society for Equitation Science

Improving the training and welfare of horses worldwide
through objective research and advanced practice



www.equitationsscience.com