Conference Proceedings
ISES SYDNEY 2009

International Society for Equitation Science
5th International Conference

Ethical Equitation – A Sustainable Approach

Editors:
Associate Professor Paul McGreevy
Dr Amanda Warren-Smith
Ms Catherine Oddie

International Society
for Equitation Science

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WELCOME

As Chair of the Local Organising Committee, it gives me great pleasure to welcome you to Australia for ISES Sydney 2009. This meeting of the International Society for Equitation Science is something of a home-coming for the society since our first symposium was held in Melbourne in 2005.

The theme for ISES Sydney 2009 is **Ethical Equitation – A Sustainable Approach**. With the ever-increasing demands for athleticism and performance within equestrian sports and production systems worldwide, this is the topic trainers, riders and coaches need to engage with before other stakeholders have the debate for us.

The ISES symposia represent a unique gathering of equitation scientists, industry leaders and policy makers to carve out a road-map for the future of the horse in the human domain.

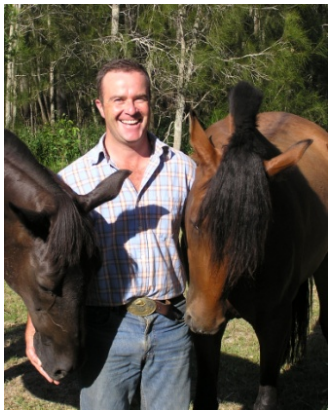
I would like to personally thank all those who have contributed in any way to the organisation of this meeting. I am grateful for the support of the University of Sydney's Faculty of Veterinary Science and the efforts of the staff associated with our two venues; the Veterinary Science Conference Centre and Centennial Parklands Equestrian Complex. Sincere thanks also to my hard working Local Organising Committee members, Website Coordinator and Pamela Staines at Fruition Print and Production Consultants for calmly managing the diverse printing requirements of the conference.

I expect an exciting scientific program and I am very confident that the meeting arrangements and social program will ensure a successful and enjoyable ISES Sydney 2009.

Smile – you're in Australia!

Dr Paul McGreevy

Chair of the Local Organising Committee, ISES Sydney 2009



ISES SYDNEY 2009

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TIMETABLE DAY 1 – SUNDAY JULY 12TH 2009

Time	Activity	Presenter/s
8.00am	Registration	
8.30am	Welcome and address from RIRDC	
8.50am	**Plenary 1 – The role of the event veterinarian in equestrian sport and the importance of research to welfare and athletic performance**	**Professor Leo Jeffcott**
Behaviour problems. Chair: Dr Andrew McLean		
9.35am	Horse misbehaviour as a cause of poor performance	P Buckley, J Morton, DJ Buckley, GT Coleman
9.55am	Feeding routine risk factors associated with pre-feeding behaviour problems in UK leisure horses	J Hockenhull, E Creighton
10.15am	Equipment and training risk factors associated with ridden behaviour problems in UK leisure horses	J Hockenhull, E Creighton
10.35am	Coffee	
Measuring performance. Chair: Dr Jack Murphy		
11.05am	Measuring the behavioural expression of horses competing in a 160 km endurance ride	C Dorman, A Barnes, P Fleming
11.25am	The use of accelerometry and rein tension to objectively assess the head carriage of horses	AK Warren-Smith, BB Bronicki
11.45am	The use of pedometers to assess motor laterality in grazing horses	AK Warren-Smith, PD McGreevy
12.05pm	Assessment of stress level in horses during competition, using salivary cortisol: preliminary studies	M Peeters, J Sulon, D Serteyn, M Vandenheede
12.15pm	Poster Teasers Session I: Posters 1-10	Natalie Waran
12.35pm	Lunch and lecture: Denmark - a paradigm shift in sport horse welfare 1.00 to 1.45 pm in Webster Lecture Theatre	Susan Kjaergard
Calming and positive reinforcement. Chair: Dr Emma Creighton		
2.00pm	Evaluating memory of a learning theory experiment one year later in horses	CR Heleski, NM Bello
2.20pm	Trailer loading of horses: is there a difference in positive and negative reinforcement concerning stress related symptoms and effectiveness?	P Hendriksen, K Elmgreen, J Ladewig
2.40pm	The use of Equine Appeasing Pheromone to reduce ethological and physiological stress symptoms in horses	AJH Van Sommeren, MC van Dierendonck
3.00pm	The influence of human presence on calming aroused horses	AK Warren-Smith, L Greetham, PD McGreevy
3.20pm	Coffee	
Welfare. Chair: Dr Camie Heleski		
3.50pm	Characterisation of anticipatory behaviour in domesticated horses: Strategies for future welfare assessment in horses?	MC van Dierendonck, EH Bleijenberg, SM Peters, JE van der Harst, BM Spruijt
4.10pm	The development of a tool to measure educator attitudes regarding equine welfare	NM Rappaport, NA Knoblach, EA Pajor, CM Brady
4.30pm	Poster Teasers Session II: Posters 11-20	Natalie Waran
4.50pm	Wrap-up Day 1	Moderator: David Evans
5.30pm	Finish	
7.30pm	Conference Dinner at the Women's College	

TIMETABLE DAY 2 – MONDAY JULY 13TH 2009

Time	Activity	Presenter/s
8.15am	Registration and coffee	
8.30am	House-keeping	
8.35am	**Plenary 2 – Fear, avoidance, and safety signals as rewards**	**Professor Bob Boakes**
9.20am	Get on coaches	
10.00am	**Practical Sessions – Centennial Parklands Equestrian Complex.**	
10.00am	Learning theory in Dressage	Dr Andrew McLean, Warwick McLean and Brett Parbery
10.50am	Showjumping	Colleen Brook
11.40am	Endurance	Meg Wade (TBC)
12.30pm	Lunch	
1.30pm	Film and TV work	Steve Jeffreys
2.20pm	Clicker training	Georgia Bruce
3.45pm	Practical Session Debrief	Moderator: David Evans
4.45pm	Finish and board coaches	
7.30pm	Harbour Cruise (optional)	

TIMETABLE DAY 3 – TUESDAY JULY 14TH 2009

Time	Activity	Presenter/s
8.15am	Registration	
8.30am	House-keeping	
8.35am	**Plenary 3 – Ethical equitation – what's in it for the horse?**	**Dr Bidda Jones**
Ethology and temperament. Chair: Lisa Ashton		
9.20am	Use of different items of "enrichment" for individual and group kept horses	GHM Jørgensen, S Hanche-Olsen, KE Bøe
9.40am	Further investigations into the ethological relevance of round-yard training of horses	D Koster, AC Wegert, BB Bronicki, AK Warren-Smith
10.00am	Experts' assessment of temperament in sport horses	EK Visser, K Karlas, I Van Deurzen, CG van Reenen
10.20am	Coffee	
Competition. Chair: Dr Kathalijne Visser		
10.50am	The relationship between trait anxiety, trait competitive anxiety, riding experience, accident/injury status, and state competitive anxiety for equestrian athletes	RC Hogg, GA Hodgins
11.10am	A preliminary investigation into mood states of advanced and novice dressage riders prior to competition	IA Wolframm, J Shearman, D Micklewright
11.30am	Aprons for all X-country fences: simple safety solution for horse trials	J Murphy
Education. Chair: Elke Hartmann		
11.50am	Equitation science in Mounted Police training	R Thomas
12.10pm	Equitation science in tertiary education	H Randle, L Ashton
12.30pm	Lunch	
1.00pm	Move into Break-out Groups 1 and 2	Moderator: David Evans
	Group 1: How to bridge the gap between the laboratory and the arena?	Marc Pierard
	Group 2: Identifying and resolving horse welfare issues in training and performance.	Jenny Carroll
2.00pm	Feedback to conference on Break-out 1	Hayley Randle and Jen Clulow
2.30pm	Feedback to conference on Break-out 2	Machteld van Dierendonck and Catherine Oddie
3.20pm	Conference wrap-up and Special Prize Draw	Moderator: David Evans
4.00pm	**ISES AGM. Everyone is welcome to attend the AGM, but only ISES members are eligible to vote**	
5.30pm	Close	

ABSTRACTS FOR DAY 1

Plenary 1: The role of the event veterinarian in equestrian sport and the importance of research to welfare and athletic performance

Leo Jeffcott

Faculty of Veterinary Science, University of Sydney, NSW, Australia.

Abstract

The popularity of equestrian sport today continues to increase along with the corresponding rise in the level of competitiveness. The range of disciplines that horses can compete at international level is also expanding, and there are now 8 official disciplines under the control of the Federation Equestré International (FEI) (Jumping, Dressage, Eventing, Endurance, Driving, Vaulting, Reining and Paraequestrian). This demand creates a vast range of problems in relation to means of effective training, creating a level playing field for all types of competition, ensuring the fitness of horses to compete, providing appropriate conditions for welfare, safety, husbandry and the environment, as well as the provision of suitable facilities to run elite competitions around the world.

Veterinary involvement in equestrian sport is therefore crucial, not only to ensure the safety and welfare of the horse, but to promote and be involved with applied research that will ultimately benefit the sport. In this presentation I will firstly outline some of the aspects involved with working as a veterinary official (FEI Event Veterinarian) for the last 32 years. This has principally involved attendance at elite competitions across a range of disciplines around the world, including 6 Olympic Games, 4 World Equestrian Games and 4 World Cups. An example of veterinary intervention into FEI competition has been the introduction of a standardised protocol for Horse Inspections to assess fitness to compete across all disciplines.
The second part of the presentation will be to highlight some of the important areas of research that have arisen directly from problems in international competition. These will include: i) The abuse of jumping horses by hypersensitisation (rapping). ii) The problems associated with performing in hot/humid climates leading to exhaustion and heat stress. iii) The effects of drugs and medication and the need to ensure a 'drug-free' sport. iv) The effects of transport stress on horses travelling to and from competition venues. v) The hazards of horse/rider falls in Eventing. vi) The use of hyperflexion (Rollkur) in Dressage and its likely welfare implications.

In conclusion, I will draw together my thoughts on the future directions of applied research in equestrian sport, and emphasise the need for international collaboration and a multidisciplinary approach.

Brief Biography

A graduate of the Royal Veterinary College, UK, Professor Leo Jeffcott is the Dean of the Faculty of Veterinary Science, University of Sydney. He has held senior clinical and academic posts at veterinary faculties in Upsaala (Sweden), Melbourne and Cambridge. Professor Jeffcott has broad interests in clinical and applied research of the horse. The current thrust of his research involves the investigation of the pathogenesis of an important condition, osteochondrosis, that causes serious losses to the horse industry worldwide. His other long term interest is in the diagnosis and treatment of back problems in performance horses. He has also been involved with extensive studies on the effects of heat/humidity on horses performing in elite competitions.

Horse misbehaviour as a cause of poor performance

Petra Buckley[1], John Morton[2], David Buckley[3], Glen Coleman[2]

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Abstract

The role of horse behaviour in horse performance not been described in the veterinary literature, despite the 60% rider injury risks attributable to horse misbehaviour published in the medical literature. Furthermore, the performance of the pleasure horse has not been defined, despite the importance of this sector of the Australian horse industry. Therefore, little is known about the potential role of veterinarians in assisting owners to optimise the performance of these animals and minimise injury risk. The aim was to profile the performance of Pony Club horses.

We conducted an exploratory owner survey which preceded and guided a subsequent epidemiological study. The survey revealed – somewhat unexpectedly - horse misbehaviour as a cause of poor performance. Based on these results we included misbehaviour as a variable in the epidemiological study. Data were collected over 13 months using monthly visits to 84 Pony Club horses as well as owner-kept diaries recording exercise patterns and the occurrence of misbehaviour.

Horses were generally exercised infrequently and for short periods, with a median of six exercise days and 10 hours, respectively each horse-month. The daily incidence risk of misbehaviour was 4.1 %. The incidence risk was highest during schooling and competition (both 5.4 %) and lowest during pleasure riding (2.5 %). More than half of all misbehaviour events were classified as dangerous (high risk of injury). Risk factors for misbehaviour included horse height (135-140cm), horse breed (Thoroughbreds least likely), and teenage riders. We were unable to demonstrate a link between back pain and misbehaviour. These results suggest an association between behaviour and performance, with a modifiable rider effect. We propose that horse performance be defined as a horse meeting rider expectation.

Implications for the welfare of the ridden horse

An understanding of behaviour in ridden horses is essential for veterinarians in the bigger context of horse welfare, health and performance. In addition to advising potential horse owners of misbehaviour risk factors, equine veterinarians could assist first-time horse owners by including a horse temperament check at the time of purchase.

Feeding routine risk factors associated with pre-feeding behaviour problems in UK leisure horses

Joanna Hockenhull, Emma Creighton

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Abstract

Domestic horses are typically provided with a diet and feeding regime that differs markedly from their evolutionary requirements. Modern feeding practices have been implicated as risk factors for a number of physiological and behavioural problems, including stereotypies. In addition, various anticipatory behaviours can be performed prior to feeding and are subsequently reinforced by the arrival of food. Such behaviours are often viewed negatively by owners and once established maybe performed in other contexts. An internet survey was used to quantify the performance of feeding-related problem behaviour in leisure horses and to identify feeding routine risk factors for this behaviour. The sample contained 1324 horses and was demographically comparable to the target population.

Seventy percent of horses performed some form of feeding-related behaviour problem, mostly of low intensity. Principle components analysis revealed three groups of problems: frustration behaviour (49% of horses), aggressive behaviour (44%) and stereotypic behaviour (39%). Feeding routine risk factors associated with each of the behaviour components were explored using logistic regression analyses. Availability of forage was associated with aggression and frustration; restricted access increased the risk of frustration behaviour, while feeding forage ad lib reduced the risk of pre-feeding aggression. While pre-feeding stereotypies were not associated with the provision of forage, they were affected by the frequency that concentrate feeds were provided and the presence of other horses during feeding. The use of multiple dietary supplements, including nutritional calmers, increased the risk of pre-feeding aggression and stereotypic behaviour, although it is likely that supplements were used in response to the horse's behaviour rather than involved with its development. The performance of behaviours attributed to hand feeding tit-bits, e.g. nipping and searching clothing, were associated with an increased risk of all three components, suggesting they are indicative of generic feeding-related problems. Outside of the feeding routine, regular work reduced the occurrence of all three behaviour problem components.

Implications for the welfare of the ridden horse

The association between pre-feeding behaviour problems and modern feeding practices highlights the importance of feeding horses to suit their evolutionary requirements. The performance of tit-bit-related behaviour is indicative of wider feeding-related problems and owners should be alerted to the need to reconsider their overall feeding practices.

Equipment and training risk factors associated with ridden behaviour problems in UK leisure horses

Joanna Hockenhull, Emma Creighton

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Abstract
Ridden behaviour problems are potentially dangerous for horse and rider, yet quantitative data regarding their prevalence within the leisure horse population is scarce. A large-scale Internet survey was used to address this deficit and to identify associated risk factors from the equipment and training practices used by leisure horse owners. The survey was online for a year, generating data for 1326 horses. The sample was demographically comparable to the target population.

There was a high prevalence of relatively low grade problems with 91% of ridden horses exhibiting some form of problem behaviour under saddle. Horses with more problems showed higher intensity of problems. These behaviours did not occur at random. Principle components analysis extracted four components, each comprised of problems with a distinct theme. Not slowing/resistance problems were reported for 84% of horses, expressions of physical discomfort for 61%, jumping-related issues for 36%, and extreme conflict behaviour for 22% of horses. Risk factors associated with each of the four behaviour problem components were explored using logistic regression analyses. The exact risk factors differed between components; however, three key themes emerged. Saddle-related factors were associated with all four components, with reduced risk of problems in saddles that allow greater movement through the shoulder, and in owners that took more responsibility for checking the saddle fit themselves rather than relying on routine (e.g. annual) professional checks. Footcare and shoeing practices were associated with three of the four components, although the lack of research in this area means that the mechanisms behind these associations are unclear. Lastly, factors indicative of an outcome-centred approach by riders, including the use of artificial aids (e.g. martingales) and traditional (e.g. BHS) training techniques, were associated with an increased risk of all four behaviour problem components. Conversely, using more horse-centred approaches (e.g. spending time with the horse outside work) reduced the likelihood of problems occurring.

Implications for the welfare of the ridden horse
These findings endorse the need for riders to investigate the underlying causes of behaviour problems under saddle and provide indicators of the most likely causes. They suggest that tackling the behaviour without addressing the cause leads to escalating severity and number of problems.

Measuring the behavioural expression of horses competing in a 160 km endurance ride

Cheree Dorman, Anne Barnes, Patricia (Trish) Fleming

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Abstract

We assessed the behavioural expression of competing endurance horses. The health and physiology of endurance horses is evaluated before, during, and at the end of a ride, but there are no formal mechanisms to measure their behaviour. Qualitative behavioural assessment (QBA) has been used with farm animals, whereby multiple observers use free choice profiling to score how animals are behaving, and multivariate analysis of these scores results in a statistical measure of consensus between observers about the animal's behaviour.

We videoed ten horses competing in a 160 km endurance ride at their veterinary examination pre-ride, mid-way through, and at the end of the ride. The horses were the top four finishers, four slower finishers, and two that were eliminated during the ride, one for lameness and one for metabolic reasons. Thirty-three observers generated descriptive terms then watched video clips and scored each horse using their own terms. Generalised Procrustes Analysis was performed to determine consensus between the observers by detecting patterns in their scoring of behavioural expression. Three main dimensions of behaviour were detected. The two extremes of each dimension were labelled by assigning terms more frequently used by observers: Dimension 1 was labelled as agitated/relaxed, Dimension 2 as excited/tired, while Dimension 3 appeared to indicate engagement of the horse with its environment. There were significant effects of time of ride, and of group of horses on the scores, and individual differences were also noted. The horses scored as significantly more "tired" (Dimension 2) mid-way through and at the end of the ride, compared to pre-ride ($P<0.05$). The eight horses that finished the ride successfully scored as more "engaged" (Dimension 3) pre-ride than the two unsuccessful horses ($P<0.05$).

Implications for the welfare of the ridden horse

QBA can be used to assess the behavioural expression of endurance horses in competition and does detect differences between horses and at different stages of the ride. QBA may be a useful addition to evaluation of health and physiological measures of competing horses.

The use of accelerometry and rein tension to objectively assess the head carriage of horses

Amanda K Warren-Smith, Bartlomiej B Bronicki

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Abstract

In most equestrian disciplines, the horse's head position whilst performing will influence results. Dressage horses are required to be 'on the vertical' such that their nasal plane is perpendicular (or within 6 degrees) to the ground. This head carriage should be maintained with lightness i.e. minimal tension in the reins. Judging of dressage is subjective and previous research has shown that accredited dressage judges are not always able to assess lightness; a problem that could be overcome with the implementation of objective measures.

Using the Rein Check® with a tri-axial accelerometer, the rein tensions and head movements of riding horses (n=2) were recorded when travelling on the long-side of a dressage arena, wearing either a bitted (B) or bitless bridle (BL). When wearing the B, mean rein tensions during medium walk were 1.15 ± 0.0 and 1.41 ± 0.0 N and at working trot were 1.86 ± 0.0 and 2.12 ± 0.0 N on the left and right reins respectively. The mean rein tensions in the BL during medium walk were 0.56 ± 0.6 and 0.85 ± 0.7 N and at working trot were 0.91 ± 0.9 and 0.95 ± 0.7 N on the left and right reins respectively. The head position in the B varied from -1.26 ± 0.1 to 12.37 ± 0.1 degrees at medium walk and from 11.69 ± 0.4 to 33.98 ± 1.1 degrees in working trot. The head position in the BL varied from -2.98 ± 0.1 to 3.49 ± 0.1 degrees at medium walk and from 13.01 ± 0.4 to 42.58 ± 1.1 degrees in working trot.

Implications for the welfare of the ridden horse

If the progressive training of a horse is correct, self carriage will develop naturally and the horse will be able to maintain the 'on the vertical' posture with 'lightness' and importantly, without the rider forcing the head position of the horse. Unfortunately this is rarely the case in modern day competition and the welfare of horses in this situation is severely compromised. If horse training is to be ethical and the career of a performance horse is to be sustainable, objective measures of parameters such as lightness and the position of the nasal plane are required to overcome problems associated with the subjective nature of judging. This can be achieved with the use of equipment such as accelerometers and tensiometers which are unobtrusive and simple to use.

The use of pedometers to assess motor laterality in grazing horses

Amanda K Warren-Smith[1] and Paul D McGreevy[2]

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Abstract

Motor lateralisation is of interest to equitation scientists because it may influence balance during ridden work and increase the risk of degenerative musculoskeletal disease. Furthermore, data from other species suggest that a motor bias can be associated with temperament. Although the forelegs alternate in leading during grazing, the time horses spend with the left leg advanced is generally longer than for the right. Recording this bias requires direct observation for a minimum of 50 minutes by an operator able to avoid parallax errors by moving around the horse. Moving around the horse has the potential to create an operator effect, so an objective measure is desirable.

The current study used pedometers (G-Sensor 2025 Accelerometer Million Step Pedometer, Pedometers Australia; made for the study of human exercise) to record activity of both forelegs of domestic horses (n=6) maintained in small groups at pasture. Readings were taken over an 8 hour period daily for five days. The paired t-tests showed that over the five days, two horses exhibited significantly more movements with the left leg than the right (P=0.018 and 0.034, respectively). The same two horses showed a significant preference every day of the study. Of the other horses, three showed a significant left preference on 3 days and one on 4 days. A significant right bias was recorded on 2 days for one horse and 1 day for two horses. The results suggest the use of pedometers over several days produces valid assessments of individual motor bias that reflect the published population bias.

The use of pedometers holds promise for scoring motor laterality in large numbers of horses without the logistic challenges of direct observation. Surprisingly, the current data suggest that the reported population bias to stand with the left leg forward may be achieved by taking more steps with the left than the right leg.

Implications for the welfare of the ridden horse

Improved appreciation of innate asymmetries in horses should prompt appropriate customising of training programs and assessment of young-stock for certain performance activities (e.g. racing on courses that are clockwise or counter-clockwise) that compliment their asymmetry and reduce lateralised wear-and-tear.

Assessment of stress level in horses during competition, using salivary cortisol: preliminary studies

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Abstract
During a competition period horses are submitted to various sources of stress which could have a negative influence on performance, welfare and human safety. Serum sampling for cortisol (a well-known indirect indicator of stress) is not always well accepted by the owner and can also be stressful for horses. These studies investigate saliva sampling as an alternative non-invasive method for cortisol level measurement in horses.

In a first preliminary study, 5 horses were serum and saliva sampled, before and after a cross-country round. In the second study, 5 horses and one rider were saliva sampled at home (7 samples/12h) to assess their cortisol baseline and during a one day eventing competition (15-18 samples during training, around dressage, show-jumping and cross-country). During the first study, mean serum cortisol concentrations were 166.73±27.34 nM before the cross country round and 232.38±43.81 nM after (n=5, paired T test, $p<0.05$). Before the cross-country round, mean salivary cortisol levels were 1.19±0.83 nM and 4.03±2.41 nM after (n=5, paired t test, $p<0.05$). During the second study, horses mean salivary cortisol concentration was 0.59±0.40 nM at home, and 2.13±1.49 nM during competition (n=5, T test, $p<0.001$). Cortisol peaks were observed just after dressage (3.59±2.26 nM), jumping (2.26±0.72 nM) and cross-country (2.29±1.09 nM) rounds. The rider's mean salivary cortisol concentration was 3.51±2.42 nM (n=8) at home and 4.9±4.99 nM (n=28) during competition, rising to 14.50 nM after a cross-country round. A correlation was found between salivary cortisol levels of the rider and her horses during an event (Pearson correlation $r=0.54$, $p<0.01$, n=28).

Saliva seems thus to be a good alternative to serum to measure cortisol level in horses during competition. Further studies are needed to measure stress in riders, and the relationships with horses' stress.

Implications for the welfare of ridden horses: Equine Stress Management
Measurement of cortisol via saliva samples is suggested as an alternative to blood sampling. Saliva sampling is a less invasive and less 'upsetting' method for horse and rider. A validated measurement of stress of both horses and riders during competition should permit to test the effect of different variables (e.g. nutritional so-called 'stressless' additives, housing, transport, training, interaction rider-horse …) on performance and welfare of both "partners".

Evaluating memory of a learning theory experiment one year later in horses

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Abstract

In 2007, 34 horses were presented with a novel, typically frightening task (i.e. crossing a tarpaulin) using either negative reinforcement (NR) or negative plus positive reinforcement (NR + PR). For NR, the halter/lead were pulled, when the horse stepped forward, pressure was released; process repeated until calmness criterion met (i.e. horse crossed tarpaulin with little/no obvious anxiety). For NR + PR, whenever the subject stepped forward, it was rewarded with oats and verbal praise. In 2008, 13 original subjects were available for follow-up evaluation; 6 and 7 had been originally assigned to NR and NR + PR, respectively. Available subjects were re-presented with the tarpaulin task (TT) in the original location with identical handler, but this time all horses under NR. The rationale for using NR only was that some industry personnel had questioned whether horses trained to TT with a food reward would rely upon rewards to effectively cross. Time differences between treatments were analysed using a general linear mixed model. We identified an effect of treatment on memory of the task, as quantified by the difference between 2008 and 2007 in crossing time (P = 0.02) and in time to achieve calmness criterion (P = 0.02). Horses originally exposed to NR + PR crossed faster in 2008 than 2007, showing support for memory of the original task. The learning experience was, however, not noticed in horses originally assigned to NR, who showed no difference in time to crossing between 2008 and 2007 (P = 0.15). Horses originally assigned to NR + PR achieved calmness criterion sooner in 2008 than 2007 (P = 0.02); in contrast, horses originally assigned to NR took longer to achieve calmness criterion in 2008 than 2007. There was no time difference in crossing between the treatments in 2007 (P = 0.30).

Implications for the welfare of the ridden horse

This study offers support for horses' long term memory, at least when a learning task is initially associated with PR. It refutes concerns that food rewards will continue to be required to perform tasks. More testing should be done using a wider range of learning tasks.

Trailer loading of horses: is there a difference in positive and negative reinforcement concerning stress related symptoms and effectiveness?

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Abstract
A stressed horse can create an unsafe training environment. Positive (PR) and negative reinforcement (NR) were compared in order to find the least stressing training method. 12 horses with severe trailer loading problems were selected and subjected to trailer loading. They were randomly assigned to one of the two 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 subjected to clicker training and taught to follow a target into the trailer. PR was conducted without the use of NR, though a pressure was applied to stop the horse, if it moved more than 10 meters away from the trailer. The training was then resumed using PR at the new position. During both training methods the timing of the trainer's signals were considered of high importance.

Stress related behavior, avoidance and heart rate were recorded. Training was completed when the horse could enter the trailer upon a signal or was terminated after 15 sessions. Ten of the 12 horses reached the criterion within the 15 sessions. One horse was eliminated from the study due to illness and one PR horse failed to enter the trailer.

SAS 9.1 was used for statistical analysis. NR horses displayed significantly more stress related behavior and avoidance than PR horses. No difference could be seen in heart rate between the two methods. The time spent on completing the training was lower for PR horses than NR horses. In conclusion PR results in a calmer horse and a faster training solution. The disadvantage of PR is not being able to intensify a pressure if the horse refuses to cooperate.

Implications for the welfare of the ridden horse
Training can be completed using only PR, but for safety reasons a lead rope should be used, in case the horse reacts unexpectedly. Exaggerated pressure can stress a horse and create a dangerous situation; hence it is advisable to use a method which motivates the horse to cooperate instead of applying pressure. This is especially the case if the trainer is not confident in the timing and usage of NR.

The use of Equine Appeasing Pheromone to reduce ethological and physiological stress symptoms in horses

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Abstract
Humans often impose a lot of stressors onto equines when working with them. Horses can be habituated to stressors, but sometimes the creation of some stress is unavoidable. For instance the first separation during weaning imposes sometimes severe stress. The use of synthetic Equine Appeasing Pheromone (EAP) could potentially facilitate the habituation process naturally, without using forbidden substances.

Two double-blind placebo-controlled studies assessed the effect of EAP on ethological and physiological stress parameters in 1) dams and foals during short-term maternal separations and 2) in adult horses during "clipping". In the weaning experiment, 32 dam and foal pairs were divided over four matched control groups with either the mare or the foal getting EAP, or both or none getting EAP. In the "clipping" experiment 41 horses were divided over two groups based on their initial reaction to the sound of clippers. Half of the horses in each group were treated either with EAP or with the placebo. The dams and foals were subjected to separation on three consecutive days (five, ten, twenty minutes), while in the "clipping" test the horses were confronted with the sound and sight of a clipper on five consecutive days.

The most interesting results revealed a significant decrease in the frequency of unrest behaviours in the foals treated with EAP in the weaning study and a significant decrease in duration of unrest behaviours in the horses of the high reactive treated group in the "clipping" study. In the weaning study this treatment effect of EAP was still apparent six weeks: the day after actual weaning the EAP treated foals showed significantly less stress-related behaviour, compared to the other foals. Overall, no clear treatment effect on the physiological parameters could be found in any study, possibly due to the variation being too high.

Implications of the use of EAP for the welfare of horses
A positive treatment effect of EAP on the ethological stress symptoms on foals during maternal separations and in highly reactive horses during "clipping" was found. EAP is a potentially promising "doping free" aid to facilitate habituation to potential acute stressors or stressful situations.

The influence of human presence on calming aroused horses

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Abstract

During studies of the effects of head-lowering achieved via negative reinforcement, the influence of a handler being near the horses was not measured. This potential operator effect may have confounded results; therefore this study investigated behavioural and physiological effects of the presence of a familiar handler (handled regularly for previous week) on horses after arousal.

Four groups of 7 horses were used. Group A were not aroused then left alone; B were aroused then left alone; C were not aroused then given free interaction with a familiar handler and D were aroused then given free interaction with a familiar handler. Pre-test heart rates were recorded in the test area, then those in Groups B and D were subjected to arousal (the handler jumping up and down and waving a hat beside the horse) such that the horse's heart rate exceeded 100 beats per minute. The halter and lead rope were then removed and the handler departed. For the following 300 s, the horses in Groups A and B were left alone whereas for Groups C and D, another handler with whom the horses were familiar entered the round-yard and stood still in the centre and looked at the ground.

Repeated measures analysis showed that the heart-rate of the horses was greatest during the first 0-60 s and 150-180 s post-arousal in Groups B and D and lowest in Groups A and C ($P<0.001$). The interaction of treatment-and-time showed that Group B had the highest heart-rate during the test period ($P=0.022$). Latencies to approach the handler did not differ between groups. The horses in Group D took fewer steps ($P<0.001$), were least likely to sniff the ground ($P<0.015$) or look out of the arena ($P=0.028$) and those in Group A were most likely to exhibit head lowering spontaneously ($P=0.016$).

Implications for the welfare of the ridden horse

These results suggest that allowing an aroused horse free interaction with a familiar handler has more of a calming influence than leaving the horse alone. For equitation to be ethical and sustainable, having a familiar handler present when a horse is stirred up will help calm the horse. This is important as research has shown that horses' ability to learn is enhanced by calmness.

Characterisation of anticipatory behaviour in domesticated horses: *strategies for future welfare assessment in horses?*

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Abstract

Animal welfare science strongly needs additional objective parameters for the assessment of animal welfare. Anticipatory behaviour is a potential indicator of welfare, as it reflects reward-sensitivity which is colloquial to previous experiences of animals: negative experiences are positively correlated with reward-sensitivity and vice versa. In rats and other species, anticipatory behaviour is characterised by an increase in activity. As a first step, the aim of this research was to characterise the anticipatory response on reward in horses. Behaviour, autonomic heart rate (HR) and heart rate variability (HRV) parameters have been measured to provide a full characterisation of the anticipatory response. Anticipatory behaviour and HR/HRV of thirteen horses were recorded in two separate experiments: 1) before the arrival of concentrate feeding during their normal daily routine and 2) during a standardised experimental set-up in which anticipation was evoked by Pavlovian conditioning. In the first experiment the already existing anticipatory behaviour was investigated, whereas in the second experiment a new association was induced. An extensive ethogram was used to score all behaviours, after behavioural video scoring, elements were grouped in different categories. It became apparent that the anticipatory response of the horses could be characterised as an increased activity together with tachycardia. In addition, standing ($F_{1,5}$=16.4, p=0.01), locomotion ($F_{1,5}$=4.0, p=0.1) and arousal and investigation ($F_{1,5}$=98.4, p<0.0005) duration and frequency significantly increased, while a significant decrease in maintenance behaviour ($F_{1,5}$=12.0, p=0.02) duration was shown during anticipation. Furthermore, this study also revealed clear individual differences in the anticipatory responses. Since the main characteristics of anticipation (increased activity) were relatively easy to measure, the results of this study potentially can be used as an objective tool to assess welfare of horses.

Implications of the characterisation of anticipation in welfare assessment of horses

Anticipation can be characterised clearly in horses, and, therefore, it potentially can be used as an objective tool to assess welfare of horses, as shown in rats and pigs. Now, it can be tested how anticipation behaviour reflects the way horses experience previous (husbandry or training) situations. Clarifying the relationship between anticipation on positive rewards and aversive rewards may be a future challenge.

The development of a tool to measure educator attitudes regarding equine welfare

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Abstract

There is a question of effective information transfer between institutions synthesising equine welfare science and the social reactionaries responding to cultural paradigm shifts. With a multitude of other available resources, the objectives of programs dedicated solely to teaching equine science skills may be diluted by the prevalence of alternative philosophies. These commonly-held beliefs, compounded with the authoritarian role of potentially partisan teachers in non-formal learning environments, have made it difficult to ascertain horse-enthusiasts' attitudes towards welfare in a relevant way.

An assessment to measure how adult instructors feel towards horsemanship skills can be a useful tool in addressing the emphasis of welfare education in recreational youth horse activities. We have constructed and utilised an attitudinal test to determine the worth that horse owner, manager, and caregiver educators place on knowledge skills as they relate to the compromise of welfare ideals defined by the Five Freedoms conceptual framework. This test asks adults in teaching roles to judge sixty horsemanship skills, coded to represent welfare tenets, on a bipolar scale of contrasting value statements. The individual result of the test is an overall welfare score, and welfare sub-scores for each of the Five Freedom skill categories. By soliciting responses about skills from a nationally-reviewed youth horse program curriculum, participants indicate the value that they place on behaviours expected within the confines of a functioning industry. This assessment was developed to describe the welfare attitudes of adult volunteers with a non-formal government-supported youth development program, who perceived skills related to nutrition and minimising fear and distress as the most value. The strong internal consistency reliability (α=0.975, $p<0.05$), moderate inter-item correlation (r=0.471) and content validity of the test measures in that population support its continued development for use in evaluating the welfare attitudes of different knowledgeable populations.

Implications for the welfare of the ridden horse

To progress in improving equine welfare on a global scale, baseline attitudes need to be determined for every rank of industry practitioner. Perceptions of equine welfare should be obtained as they relate to an individuals' realm of action and influence, in a way that represents personal choices of responsibility.

Conference moderator

Dr David Evans PhD BVSc (University of Sydney)

Honorary Associate Professor, Faculty of Veterinary Science, University of Sydney, NSW, Australia.
Director, Equine Health and Fitness Pty Ltd, www.equinehealthfitness.com.au

Honorary Associate Professor David Evans spent seven years in veterinary practice prior to completing his PhD in equine exercise physiology in 1987. He has 25 years experience in university research and consulting in equine exercise physiology. He also has practical experience in training Thoroughbred racehorses, and in the use of treadmills and field exercise tests for fitness evaluation in horses.

David Evans has written 15 book chapters, and over 150 research papers on topics related to racehorse fitness, exercise, training and health. Research interests have included the physiological responses to exercise and training in the race horse, and factors influencing racing performance. Recent research has focussed on development of new methods for assessing pulmonary function. Consultancy and research in methods of fitness assessment have been continued by Equine Health and Fitness Pty Ltd.

ABSTRACTS FOR DAY 2

Plenary 2 – Fear, avoidance, and safety signals as rewards

Robert Boakes

School of Psychology, University of Sydney, NSW, Australia.

Abstract

To explain how animals acquire avoidance behaviour, i.e. a response that prevents the occurrence of some aversive event, two-factor theory was developed on the basis of experiments with dogs and rats. The original version appealed to two learning processes: animals first learn to fear a stimulus – a warning signal – indicating that an aversive event such as a shock is likely to occur in the near future; and, secondly, when they make an appropriate response, this is reinforced by reduction of fear, i.e. negative reinforcement. When combined with some minor additional principles, this provides a good account of how an animal first acquires an avoidance response. However, it does not give a satisfactory account of how avoidance behaviour is maintained. In particular, well-trained animals can continue to perform some response without displaying any fear. If no longer fear, then what motivates continued good performance? The answer to this question has been to add the concept of a conditioned inhibitor of fear or 'safety signal'. This is a stimulus signalling that an otherwise expected aversive event will not occur. Such signals not only inhibit fear, but also serve as powerful positive rewards, a function that is highly resistant to extinction. The provision of clear safety signals can increase the speed with which an animal learns some new behaviour.

Welfare implications. (1) An animal can learn some form of avoidance behaviour very rapidly; subsequent maintenance of the behaviour need not involve continued stress for the animal. (2) The provision of clear and consistent safety signals can reduce stress during training.

Brief Biography

Bob Boakes is the Emeritus Professor of Psychology at the University of Sydney. After graduating from the University of Cambridge in 1963, his doctoral experiments with pigeons and monkeys at Harvard University were the beginning of four decades of studies of learning in animals. His first academic position was in Experimental Psychology at the University of Sussex (UK). Bob's early studies there concentrated on interactions between classically and instrumentally conditioned behaviour in both pigeons and rats. His interest in studies of animal behaviour in the 19th and early 20th century led to his book, *From Darwin to Behaviourism*, of 1984, which has remained the classic reference on this topic and was reprinted in 2008. During the 1980s Bob concentrated increasingly on the question of how animals learn to like or dislike particular foods. He continued research on this topic when in 1989 he emigrated to Australia to take up the Chair of Psychology at the University of Sydney, later serving as Head of School for two terms. Over the past few years, as well as continue work on flavour preferences and aversions, Bob's behavioural research with rats has investigated the impact of delay of reinforcement and the relationship between activity and body weight loss. He has also co-authored with Paul McGreevy a book on the principles of animal training, *Carrots and Sticks,* published in 2007. Although primarily concerned with animal learning, Bob supervises doctoral studies involving human participants on topics as diverse as placebo effects and wine discrimination.

Practical day presenters

Andrew McLean BSc, Dip. Ed, PhD

Andrew has a rare mix of academic knowledge and equestrian achievements. Andrew is a zoologist with a Diploma of Education and a PhD in cognitive science. He has won Australia's premier Horse Trials, the Gawler Three Day Event, and represented Australia in Horse Trials in 1989. In dressage he has competed to FEI level and trained horses to Grand Prix level; he has also ridden to Grand Prix and Championship level in Show-jumping. He has held a race trainer's licence and has won bareback races in Australia and New Zealand. Andrew has been an equestrian coach for 25 years and, with his wife Manuela, has developed the internationally recognised Australian Equine Behaviour Centre (AEBC). He has coached some of the world's greatest riders, coaches and trainers and reformed internationally competitive horses up to Olympic Games and World Championship level, as well as some top Australian racehorses.

Andrew has published numerous peer-reviewed articles, and has made original contributions to our current understanding of the animal mind that have been published in peer-reviewed journals, academic texts and as encyclopaedia entries. He has been instrumental in forming the International Society for Equitation Science, of which he is vice-president. His goal is to create knowledge bases for equitation science in the universities of the world and to ensure that horse training is optimally ethical, sustainable and evidence-based. He conducts clinics in 10 countries, has given lectures and demonstrations at Saumur, France, and twice at the Global Dressage forum, as well as at many of the world's leading veterinary universities. One of his books, *The Truth About Horses*, is Australia's top equestrian international best seller and is available in Dutch, Spanish and Danish. Andrew is also the head trainer for WEPA (Working Elephant Programme of Asia) and conducts elephant training workshops throughout Asia promoting an elephant friendly method of elephant training that has been embraced by the Nepalese government in a 5 year plan.

Learning theory in dressage: Warwick McLean

Warwick McLean is the senior resident trainer at the Australian Equine Behaviour Centre. He conducts clinics in 5 states of Australia, 4 venues throughout New Zealand, in Finland, Denmark and the UK. Warwick is a keen competition rider currently competing at Grand Prix dressage on the Swedish Warmblood 'Chiaretto' and Advanced/Prix St George on the imported Hanoverian Stallion 'Alessandro' who he started and has trained himself over the past 5 years. He has also competed successfully at CIC** eventing. Warwick is renowned for his ability to produce relaxed and obedient youngsters and as an effective re-trainer of problem behaviours.

Learning theory in dressage: Brett Parberry

Brett Parbery was raised on a cattle property in the mountainous district of Dorrigo, NSW. He grew up as part of a professional training stable team producing horses for western sports such as cutting, campdrafting and rodeo. After a thriving career in western horse sports, including a successful stint competing on the pro rodeo circuit of North America and Canada, Brett decided to return to Australia to search for new challenges in the equine industry. Having always been fascinated with the equestrian sports, Brett decided to try his hand at the most complex of them all, dressage.

Since committing to dressage in 1998, Brett has had success at both State and National levels, and has spent three of the last five years abroad learning his chosen trade from the best in the world, the Germans and the Dutch. Brett has now established a professional training stable, Cedar Lodge, where he and his partner Melinda and their elite team of dressage horses enjoy world class facilities in the beautiful Southern Highlands of NSW. Brett is a current member of the Australian Elite Squad. In 2008, he was a member of Australian Shadow Team – Pre Olympic Selections; of the Australian Team for Aachen and Rotterdam CHIO and was selected as non travelling reserve Australian Olympic Team. His competition successes are extensive and highlights for 2009 alone include:

- Winner - Grand Prix PSI Dressage with the Stars CDI 2*, and Freestyle Dressage setting a new Australian Record 74.1%
- Winner - Sydney CDI 3* Grand Prix. New Australian Record 70.34%
- Winner - Sydney CDI 3* Grand Prix Freestyle

Showjumping: Colleen Brook

Colleen Brook has represented Australia at the highest levels of showjumping, notably the World Championships and World Cup Finals. She has competed successfully in America, Europe, Japan, Korea and Kuwait. Her awards are too numerous to list but highlights include winning the Nations Cup Tour in New Zealand and the Tokyo Grand Prix. She has been awarded the Alice Laidlaw trophy for lady rider over obstacles at Melbourne Royal Show and Champion Lady rider on the flat Sydney Royal Easter Show.

Colleen describes growing up in country NSW in a dairy community, 'My love of horses comes from who knows where, though my parents grew up in the era when horses were used on the farm firstly and pleasure secondly. Like many others my passion has always been horses'.

'I did the normal things a country kid did, attended pony club and rode horses as much and as often as I could. As I grew up, horses were still my passion. I left school and became a full time rider and along the way a coach. I now have a Level 3 Coach accreditation in Showjumping and Eventing and am also a Coach Educator and Assessor', she said.

'Horses have enabled me to travel the world competing and teaching. I am especially interested in the way horses respond to training. How do we manage their basic needs and comfort, as well as coaxing amazing performances from these wonderful animals? Can we do a better job for our horses? Of course we can?'

Film and TV work: Steve Jefferys

Steve Jefferys is a professional trainer, instructor, entertainer and public speaker from Sydney in NSW. Steve became interested in horses at the age of twelve and is largely self-taught. Developing a natural talent with the aid of observation, analysis and experimentation he has become one of Australia's most versatile horsemen.

Steve is renown worldwide as the man who opened the Sydney 2000 Olympic Games, with that breathtaking gallop on to centre stage. He also received international recognition for his entertainment during the equestrian events at the games. Other memorable experiences include:

- His role in the Man From Snowy River Arena Spectacular which toured Australia
- Many appearances at Equitana Asia Pacific.
- Horsemaster for the spectacular Opening and Closing Ceremonies of the 15th Asian Games in Doha, which featured a heart-stopping climb to light the Caldron.
- In 2008, his horses Jamieson and Drummer toured and performed with the Australian Opera company's production of *Carmen*.

Steve is a successful competitor in many disciplines. He conducts clinics and seminars throughout Australia catering for riders of all levels and disciplines. He believes that regardless of the discipline the basic requirements are the same. Whether you are a pleasure rider, campdrafter, dressage rider or showjumper, to be the best you need an obedient, balanced, responsive and supple horse.

Steve admires his horses for their ability and trust, "I'm amazed by how such large and powerful animals can become so submissive and domesticated."

Clicker training: Georgia Bruce

Georgia Bruce is from Kuranda in far north Queensland. She has represented Australia eight times in dressage including winning two bronze medals at the 2008 Paralympic Games. Georgia is an unusual equestrian competitor as she also competes successfully in many other events including western performance, reining, cutting and hacking. Georgia trains trick and liberty horses as well as starting young horses and retraining problem horses. She is also a qualified coach and dressage judge with the Equestrian Federation Australia.

Georgia's main interest is in equine learning and behaviour. She has been studying Operant Conditioning for the past 11 years and is a specialist in "Clicker Training" or Secondary Positive Reinforcement. Georgia and her horse "Rumba the Wonder Horse" perform trick shows and Clicker Training demonstrations around Australia. Using Clicker Training Georgia has taught Rumba to do tricks, paint pictures and perform grand prix dressage movements both under saddle and at liberty. Georgia also works at the Cairns Wildlife Safari Reserve, where she uses Clicker Training with exotic animals for enrichment and to allow simple medical procedures to be performed.

Georgia has written two books about Clicker Training: *How to Click with Your Horse* and *How to Teach Your Horse Tricks With Clicker Training*. For more info about Georgia please see: www.horsetraining.org

Practical day introduction

Providing relevant and technically appropriate practical sessions during a conference like this can be difficult. We need to balance the focus of science with the skills, knowledge and techniques of reputable horse riders and trainers. We want to encourage objective debate about the practical application of learning theory to the care and welfare of the horse and debate the merits or otherwise of equipment and methods, while at the same time appreciating the demands of contemporary competition.

All legitimate horsemen and women care about the welfare of the horse - but some of our practices are based on methods developed when horses were often seen as beasts of burden, to be replaced - just like the tractor when it outlived its useful life. This attitude is no longer acceptable. Horses are expensive to purchase, train and maintain, so it is in the best interest of everyone if the training and management methods used provide an environment where horses thrive. We have other factors to contend with too. Animal welfare groups have a strong influence on public perceptions – the speed and scope of media delivery means that images fly around the world in seconds after an incident. Therefore we need to be proactive in discussing and promoting ethical and sustainable training and management systems before someone else dictates our practices to us.

We will try to present a program today that illustrates how some of our internationally successful Australian horsemen and women have developed the methods of training and handling that they use today. All have achieved international success and have a reputation for the management of their horses. They will present the story of how their methods have evolved and demonstrate a few exercises to illustrate their techniques.

As an adjunct to the trainers' presentations, we will demonstrate objective measurement tools that can assist with developing the rider's understanding of their own signals to, and influences on, the horse. Rein tension gauges, heart rate and gait analysis tools will be used as well as video software to compare performances.

At the end of the practical sessions, a panel discussion will review what we have seen, identifying consistent themes and potential areas for further research.

As you can appreciate with the limited time available, and in an attempt to cover a range of disciplines, it is not possible to unpack the complete training system of each of the trainers. We accept that not everyone will agree with all of the methods and equipment used, and we look forward to positive and lively discussion. However we ask you to consider that these horsemen and women have agreed to demonstrate today because they too are interested in including new ideas that support ethical and sustainable practices that can allow their horse to have long and successful careers with minimal stress and conflict.

Horse training is not static and all responsible horse people will continue to investigate and challenge their own techniques - especially when the next horse arrives in their stable that has not read the manual.

Jenny Carroll
ISES Sydney Organising Committee

ABSTRACTS FOR DAY 3

Plenary 3 – Ethical equitation – what's in it for the horse?

Bidda Jones

RSPCA Australia, Deakin West, ACT, Australia and Faculty of Veterinary Science, University of Sydney, NSW, Australia.

Abstract

The use of horses by humans has been embedded in our society for more than three thousand years. While developing countries continue to use horses as working animals, in Western culture horses are now predominantly used for recreational, competitive or performing purposes and are the basis of a multi-billion dollar industry. Aside from inspiring gambling, horses often provoke strong emotional responses in people and, as a consequence, there is probably more written about our relationship with horses than with any other animal. However, as the very recent development of the discipline of equitation science indicates, our scientific understanding of this relationship is limited: so much of what we do know is based on human experience and opinion and therefore inevitably has an anthropocentric bias.

With growing public interest in animal welfare across a range of issues, debate over the ethics of equitation is also increasing and attempts are beginning to be made to shift the perspective to that of the horse. Public concern over the use of horses by humans often focuses on their performance in competitive events, especially when horses are injured or die in front of an audience. But any use of horses is inevitably associated with a range of other activities and interventions that, collectively, have the potential to result in significant adverse physiological and behavioural impacts on the horse. While the duration and severity of these impacts vary according to the way in which horses are kept, handled, trained and used, the requirements of equitation are such that they cannot be eliminated. It is difficult to provide a quantified answer to the question 'what's in it for the horse', but on balance it appears that the bargain struck between horse and human is heavily weighted in favour of humans.

This paper will explore the impact on the welfare of horses of a range of activities and practices used in modern equitation, what strategies have been identified for minimising these impacts, and how contemporary horse use can continue to be accepted and justified when the purpose is ultimately for people to have 'fun'.

Brief Biography

Bidda Jones is the Chief Scientist with RSPCA Australia, based in Canberra. She graduated with honours in zoology from the University of Sheffield in 1988 and completed her PhD on the vocal behaviour of common marmosets at the University of London in 1993. She began working to improve the welfare of laboratory primates during her PhD and then as the first Scientific Officer to specialise in primate welfare for the UK RSPCA. Since 1996 she has worked for RSPCA Australia providing science-based advice and information on a wide range of animal welfare policy issues to government, industry and the public. She has been involved in researching and reporting on issues across every sector of animal use, including the transport and export of livestock, humane management of kangaroos, wastage of race horses, surveying the level of pet obesity in Australia, the generation and use of genetically modified animals, improving the humaneness of vertebrate pest control techniques, trade in zoo animals, and developing humane accreditation standards for farm animals. She has been an honorary associate and now honorary lecturer with the Faculty of Veterinary Science at the University of Sydney since 2000. Bidda lives in the bush near Braidwood, NSW and contemplates the ethics of equitation while watching her two daughters learn how to ride.

Use of different items of "enrichment" for individual and group kept horses

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Abstract
The aim of this experiment was to test the effect of different occupational items on horses' activity and behaviour when they were kept either individually or in groups.

In study 1 we used 8 randomly selected Warmblood riding horses that were rotated through eight similar sized paddocks, each with different objects (ball BALL, cone CONE, ball with concentrates CBALL, scratching pole POLE) or chewing materials (peat PEAT, straw STRA, branches of trees BRAN). One of the paddocks was kept without any additional items and functioned as a control (CONT). The horses were given access to each of the items for one day and their activity and contact with the items were scored every minute for one hour, twice a day. In study 2, six groups of 3-4 horses (a total of 23 horses) were given access to one of four items (STRA, BRAN, CBALL or POLE) or no item (CONT) for 4 days before observations were made in the same manner as in study 2. In order to test the effect of additional items on horse behaviour during study 1, we used a Kruskal-Wallis/Wilcoxon analysis with item (1-8) as class variable and individual horse (n=8) as statistical unit, while for study 2 we used item (1-4) as class variable and group (n=6) as statistical unit.

Individually kept horses (study 1) interacted significantly more with STRA (Mean ± SE; 20.0 ± 5.7 % of total observations) and CBALL (21.1 ± 7.4 %) than POLE (2.2 ± 1.9 %); CONE (0.4 ± 0.2 %); BALL (0.3 ± 0.2 %); PEAT (0.01 ± 0.01 %) or BRAN (6.3 ± 1.9 %) (χ^2= 63.6, *P*<0.0001). Group kept horses (study 2) spent significantly more time standing passively when given access to the POLE (38.8 ± 4.1 %) compared to CBALL (19.7 ± 3.0 %) or BRAN (22.4 ± 4.0 %) items (χ^2= 18.1, *P*<0.005).

Implications for the welfare of the ridden horse
In conclusion, horses spent more time interacting with additional items that were chewable. Implications for welfare: giving access to fresh branches from leafy trees or straw might be an inexpensive way of activating horses both kept individually or in groups.

Further investigations into the ethological relevance of round-yard training of horses

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Abstract
Practitioners often claim that during round-yard training the responses they elicit from horses are similar to signals used between young horses and mares. Preliminary research revealed that when mare-colt dyads (n=12) were placed in a round-yard, mares occupied the centre of the round-yard and chased youngsters for 0.73% of the total test period. The aim of this study was to record the behavioural interactions using a continuous sampling method during a longer time period (15 min per dyad), using a larger sample (n=90) comprising colts and fillies.

Analysis of variance revealed that mares exhibited more agonistic interactions ($P<0.001$) and vocalisations ($P=0.028$) than youngsters while youngsters exhibited more interaction with a foreign object, snapping, investigative approaches and head lowering than mares ($P<0.001$). Fillies showed more agonistic reactions ($P=0.050$), interaction with a foreign object ($P=0.009$) and investigative approaches ($P=0.048$) than colts. Colts exhibited more snorting ($P=0.033$) and maintained greater distances away from the mare ($P=0.016$) than fillies. Mares occupied the centre of the round-yard and chased youngsters for 0.27% of the test period and this was most likely to occur with colts ($P=0.001$).

Implications for the welfare of the ridden horse
The aim of training methods is to have at least some influence over the horses to which they are applied; clearly a thorough understanding of such methods is required. The results of this and other studies have shown that the responses elicited from human-horse interactions in round-yards are not reflected in horse-horse interactions. The welfare of horses being subjected to round-yard training methods may often be jeopardised by trainers having unrealistic expectations based on incorrect assumptions that the behaviour exhibited mimics that of the horse-horse interactions in more natural environments.

Experts' assessment of temperament in sport horses

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Abstract
It is suggested that temperament has an important effect on sport performances in horses and match between horse and job. Studbooks are investigating the possibility to incorporate tests for temperament in their breeding and selection programs. However, most temperament tests are not yet feasible to be used in practice.

To test the intra- and inter-observer reliability of the assessment of horse temperament, temperamental traits of 56 horses were examined by four experts. All horses (KWPN mares, 3 years of age) were exposed to a Novel Object (umbrella) test and a Handling test (cross a tarp with a handler). In addition, temperamental traits were assessed during a training session with a rider. Experts assessed the temperamental traits from videotapes twice in random order. Temperamental traits included: fearful/brave, tense/relaxed, spooky/non-spooky, cautious/uncautious, willingness/unwillingness, sensitive/unsensitive, and enthusiastic/lazy. Each trait was rated on a 6-point categorical scale based on predefined behavioural characteristics. Reliabilities were tested with Cohen's Kappa using Genstat 11.0.

Within each expert, intra-observer reliabilities were statistically significant for all traits ($0.143<K>0.922$, $P<0.05$). Likewise, there was agreement between pairs of experts (inter-observer reliabilities) in the scores of all traits, ($0.091<K>0.852$, $P<0.05$). Furthermore, there were significant correlations between temperamental traits within and between tests. In the Novel Object and Handling tests, fearful/brave was positively correlated with tense/relaxed ($Rsp=0.602$, $P=0.05$ and $Rsp=0.629$, $P<0.05$, respectively). In the Novel Object test, tense/relaxed was positively correlated with spooky/non-spooky ($Rsp=0.614$, $P<0.05$) and negatively correlated with willingness/unwillingness to approach the object ($Rsp=-0.617$, $P<0.05$). Similarly, tense/relaxed in the Handling test was negatively correlated with willingness/unwillingness to cross the tarp (and $Rsp=-0.826$, $P<0.05$ respectively). Enthusiastic/lazy assessed during the training session was positively correlated with sensitive/unsensitive to the aids of the rider ($Rsp= 0.626$, $P<0.05$).

Implications for the welfare of the ridden horse
The results of this study show that there were good intra- and inter-observer reliabilities of temperamental traits assessed with the use of a categorical scale in horses subjected to standardised behavioural tests. This approach may represent a feasible method to obtain temperamental traits in practice with the goal to match horses with jobs and therefore enhance the welfare of horses.

The relationship between trait anxiety, trait competitive anxiety, riding experience, accident/injury status, and state competitive anxiety for equestrian athletes

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Abstract
Anxiety is one of the most important psychological factors impacting the sporting performance of equestrian athletes. This study aimed to explore the relationship between state competitive anxiety and trait anxiety, riding experience, and accident/injury status for equestrian athletes, as these constructs have been linked to state competitive anxiety in past sporting research. Equestrian athletes completed a questionnaire set distributed locally and online. The response rate for the paper-copy questionnaires was 17%, while a total of 120 online surveys were returned. Due to the manner in which the online surveys were distributed, a response rate was not able to be calculated.

Trait anxiety was found to be significantly related to state competitive somatic (r = .43, N = 130, p<.01), and cognitive anxiety (r = .50, N = 130, p<.01). Trait competitive anxiety also demonstrated statistically significant positive relationships with state competitive cognitive (r = .80, N = 130, p<.01) and somatic anxiety (r = .83, N = 130, p<.01). Trait anxiety and trait competitive anxiety predicted state competitive cognitive anxiety at a statistically significant level [F (5, 124) = 65.23, p<.0005), and also predicted state competitive somatic anxiety at a statistically significant level [F (5, 124) = 86.20, p<.0005). Subjective perceptions of accident/injury severity were found to be statistically significantly related to state competitive cognitive (r = .37, N = 110, p<.01) and somatic (r = .33, N = 110, p<.01) anxiety and to predict state competitive cognitive [F (1, 108) = 17.34, p<.0005) and somatic anxiety [F (1, 108) = 13.18, p<.0005) at a statistically significant level. The findings of this study suggest that the anxiety experience of equestrian athletes may in some respects be unique from that of other sporting populations.

Implications for the welfare of the ridden horse
The findings of the current study have pertinent implications for the welfare of both horse and rider, as the anxiety levels of the rider affect not just his own performance, but the performance and welfare of his horse. This study also shows that equestrian athletes who commence riding before recovering psychologically from a prior riding accident may not only impair their own performance and welfare, but that of their horse.

A preliminary investigation into mood states of advanced and novice dressage riders prior to competition

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Abstract

Various studies have described the relationship between mood state and performance for a range of athletic activities. Such a relationship has yet to be investigated in equestrian sport. The aim of the current study was to investigate aspects of emotional composure as a potentially critical factor in the performance of equestrian disciplines like dressage. Twenty-six dressage riders (13 novice, 13 advanced; 3 male, 23 female) were asked to complete a "right now" version of the profile of mood states questionnaire (POMS-N) immediately prior to competing in a dressage test. Total Mood Disturbance (TMD) and mood subscale scores were investigated for significant differences between rider groups and mood subscales were tested for correlations. Advanced riders were found to score significantly higher on the mood subscale of anger (38.8±1.9 vs. 37.5±1.0; $p \leq 0.05$) and significantly lower on confusion (35.3±2.5 vs. 39.2±4.6; $p \leq 0.05$). In advanced riders, a positive correlation was found between mood subscales of tension and depression ($r=.65$, $p \leq 0.05$), while vigour and fatigue were negatively correlated ($r=-.64$, $p \leq 0.05$). In novice riders, positive correlations were found between tension and depression ($r=.74$, $p \leq 0.01$), as well as between confusion and tension ($r=.62$, $p \leq 0.05$), depression ($r=.67$, $p \leq 0.05$), and anger ($r=.57$, $p \leq 0.05$). Findings suggest that pre-competitive mood states of advanced riders are more facilitative to performance by allowing for greater processing efficacy and task-specific concentration than mood states of novice riders. Advanced riders also seem to be able to channel anger into more assertive, goal-directed behaviour.

Implications for the welfare of the ridden horse

The harmonious, successful horse-human dyad depends in large part on the rider's ability to control his or her emotions and resultant behaviours. The present study demonstrates that more advanced riders exhibit greater emotional control. In addition to developing relevant riding-specific skills, riders should also concentrate on developing appropriate mental skills to enhance emotional composure in order to optimise horse-rider interaction.

Aprons for all X-country fences: simple safety solution for horse trials

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Abstract
The X-country phase in horse trials or 'eventing' is a high-risk activity. Rider fatalities have occurred with alarming regularity in more recent times. Various safety schemes including 'knockable-elements', 'frangible-pins' and 'collapse-on-impact-materials' are now used in fence construction to address the danger issue. This study set out to determine if the simple addition of an apron to fence design might improve safety further.

Two hurdle type fences (A&B each 3.5m wide × 1.05m high) were constructed using similar materials (colours and textures) and incorporated into an X-country course for a series of schooling sessions with novice horses. The fences differed thus: Fence A (without an apron) was similar to standard timber hurdles in NH racing and Fence B (with an apron) was similar to French style brush hurdles. Novice horses (n=338) jumped both fences during four training days (D1:61; D2:72; D3:106 & D4:99 horses) and the position of the fences on the course was interchanged on alternate days (as either element 8 or 12). Data were captured via sagittal plane S-VHS recordings and *t*-test analyses focussed on final approach stride limb placements. The horses jumped the fences without incurring faults but exhibited significant differences in final approach stride when jumping fences A&B (*t=2.95; df=237; p=0.003*). Although some horses occasionally stepped on the apron (Fence B) and some horses made contact with the superior aspect of both fences sporadically, mean limb placements were further from Fence B (1.36m ± 0.48) than Fence A (1.20m ± 0.81) irrespective of the position of the fence element within the course configuration.

Implications for the safety of the ridden horse
To-date, rider fatalities are largely associated with rotational falls over more upright fences and the current findings suggest that the addition of aprons might ameliorate this risk. Horse and rider safety might be significantly improved during the X-country phase with this simple safety solution.

Equitation science in mounted police training

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Abstract
Globally, many police agencies are either scaling back their mounted sections or disbanding them all together. This is due, in part, to problems associated with training horses to remain obedient in diverse and unpredictable environments. However, the benefits of mounted officers are undeniable. It is estimated that one mounted officer is equal to 8 officers on foot. Police horses facilitate policing and improve the safety of police officers working in volatile environments by enabling the rapid and safe dispersal of crowds and removal of violent offenders within them. They must do so with different riders and in various challenging environments. The challenge lies in the delivery of training in the most effective, timely and ethical way. These outcomes are desirable for officers and horses alike. Fortunately, these qualities align with and emerge from the application of learning theory.

In 2006, the WA Police Mounted Section (WAPMS) was struggling to remain relevant. The changing nature of mounted police work meant that the focus of the section shifted from ceremonial and public relations duties to frontline operational policing. To survive, the section needed to adopt management and training that facilitated this shift. My exposure to the work of a number of Australian horse trainers and experience in coaching (particularly eventing) led me to adopting the principles of learning theory as the best way of delivering effective and appropriate training.

The implementation of learning theory was met with some resistance by some of the staff (but only those with previous experience in traditional equestrian training practices). However, it has proved highly successful and, in combination with improved selection of both horses and riders, has made the WAPMS highly relevant and effective.

Implications for the welfare of the ridden horse
A pleasing benefit of this process has been the improvement in morale amongst staff. Learning theory has provided a common language and way of explaining the daily challenges encountered in training. This has empowered the staff and given them a sense of ownership over the training process. But ultimately, and most importantly, the biggest benefit has been to the most important members of staff – the horses!

Equitation Science in the tertiary education sector

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Abstract

Two of the aims of the ISES are to (1) encourage and support basic and applied research into the training and welfare of horses used by humans and (2) encourage and support the teaching of equitation science in research and academic institutions, especially veterinary schools, departments of animal science and animal production, agricultural colleges and departments concerned with laboratory or companion animals or captive animals. There are currently many tertiary level 'equine science' programmes from Foundation Degree, BSc (Hons) through to Masters level. However, in the UK, it is increasingly acknowledged that some of the more traditional equine science routes have become less attractive to students wishing to make a career at the cutting edge of the developing equine industry. There is an emerging recognition of the importance of the integration of underpinning scientific principles of learning in equitation and recognition that this can both enhance the performance and improve the welfare of competition horses. Due to the close association of horses with humans, equine 'training' has become overly subjective and methodologically driven. This problem has been exacerbated by the emergence of alternative 'horsemanship' approaches which lack comprehensive understanding of the horses learning processes and utilise anthropomorphic terminology.

Two aspects of the emerging discipline of Equitation Science are crucial to the improvement of equine welfare. Firstly, the underpinning of both horse and human/rider training with learning theory and, and secondly, the use of technology to provide objective data for traditionally subjective measures (eg. saddle pressures, rein tension/contact, stride length, weight distribution). There is a clear need for tertiary level Equitation Science education in order to produce graduates capable encouraging sound ethical practice and scientific rigour within the equine sector.

Implications for the welfare of the ridden horse

Sustainable and ethical equitation relies upon first, understanding the horses' learning processes before undertaking discipline-specific training, and second, will benefit from the wide application of objective performance-related measures. Tertiary level Equitation Science graduates will make a significant contribution to the enhancement of equine practices and welfare.

ABSTRACTS FOR POSTERS

A comparison of fitness between horses with different exercise history

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Abstract
Anecdotally, many trainers believe that a horse's prior fitness level influences the horse's ability to return to that previous level of fitness after a period of rest. The aim of this study was to determine whether a horse's previous training will impact upon its current performance using standardised exercise testing.

Six horses (mean age ± se 10.3 ± 1.7 yrs) of mainly thoroughbred breeding were trained following a 14-week interval training program. The horses were divided into two groups dependent on whether they had previously undergone a similar training program within the previous twelve months (Group A) or not (Group B). Standardised exercise testing was used to compare the progress of two groups of horses during weeks 3 and 7 of a 14-week training program. The use of heart rate monitors during testing and post-exercise blood lactate concentrations enabled the level of the horse's fitness to be quantitatively assessed.

Analysis of variance showed that there was no significant difference in post-exercise plasma lactate concentration between the groups. The horses with previous training experience (Group A) had lower (115.7 v 130.6 bpm) but non-significantly different (P=0.696) heart rates than those without previous training experience (Group B) at week 3. This trend did not change after an additional four weeks of training (115.5 v 128.4 bpm; Group A and B respectively). Irrespective of training history or speed of each incremental step, there was no improvement in heart rate (i.e. lower at same exercise intensity subsequently) between week 3 (123.1 bpm) and week 7 (122.0 bpm).

Implications for the welfare of the ridden horse
The results from this trial showed that a horse's previous training history (within 12 months) will not influence the horse's ability to regain that same level of fitness after a period of rest (6 months). This has implications for riders and trainers to ensure that they do not unrealistically expect a horse returning from a spell (i.e. period of rest) to return to the previous level of fitness more readily compared to another horse that has not been fit previously.

Variability of scores in the 2008 Olympics dressage competition and implications for competition horse welfare

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Olympic dressage involves "an intimate unity between a human and a non-human" and is scored by a subjective judging process. Olympic dressage is governed by the Fédération Equestre Internationale (FEI). The FEI Code of Conduct declares the welfare of the horse as paramount.

In FEI dressage competition 'collective marks' are awarded across four domains immediately after each performance. Collective marks are designed to summarise the performance of horse and rider and must reflect the qualities of the entire performance. They are derived from the judges' observation of the separate test movements. The four domains are:

1) Paces
2) Impulsion
3) Submission
4) The rider's position and seat; correctness and effect of the aids

Submission scores make reference to lightness and other qualities that align with optimal horse welfare. We assessed the characteristics of these domains in horses competing in the 2008 Olympic Grand Prix (GP, n = 46) and Grand Prix Special (GPS, n =25) dressage competitions. We also examined the effect of judge position and used Pearson correlation coefficients to explore relationships between collective marks and test movement scores.

All four collective marks correlated with each other significantly ($P<0.001$). The weakest correlation was between paces and submission ($r=0.22$) and the strongest between impulsion and rider position scores (RPS, $r = 0.59$). In the GP, paces and submission scores were less correlated with test movement scores than the impulsion and RPS scores. In the GPS, submission scores were less correlated with individual movements than the other collective marks. Indeed, they failed to significantly correlate with 19 of the 32 movement scores ($P <0.05$). RPS varied most in the GP (s.d. = 0.73) while submissions scores varied most in the GPS (s.d. = 0.65). A REML analysis across both competitions showed all collective marks were significant in predicting final percentage scores but submission ($F = 31.27$) made the least significant contribution (Paces $F = 61.3$, Impulsion $F = 69.77$, RPS $F = 53.01$; $p< 0.001$ for all values).

Implications for the welfare of the ridden horse

Despite the importance of submission scores in the promotion of horse welfare, judges have considerable difficulty achieving consensus scoring submission and aligning it with overall performance.

The effect of rider position on the stride and step length of the horse at canter

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Abstract

Rider position (RP) is used to encourage the horse to perform to the best of its ability. However objective data on the effect of RP on measures of horse performance have yet to be published. This pilot study investigated the effect of RP on the length of horses' strides and steps. Six horse-and-rider combinations matched for ability and standard were videoed in working canter on the left rein down the 40m side of an indoor school. Each combination was recorded three times in the normal 'deep seat' and three times in the 'light seat'.

Canter stride length (CSL), forelimb step length (FSL) and hindlimb step length (HSL) (m) data were derived using the Dartfish movement analysis software. CSL was significantly longer ($F_{1,24}$=61.4; p<0.0001) when ridden in the light seat (3.44±0.16m) compared to the normal seat (3.15±0.22m). Whilst FSL was not significantly influenced by RP, horses ridden in the light seat exhibited a significantly ($F_{1,24}$=4.6; p<0.05) shorter HSL (1.10±0.09m) than in the normal seat (1.12±0.09m). CSL, FSL and HSL were all significantly influenced by horse-and-rider combination ($F_{5,24}$=9.79; p<0.0001, $F_{5,24}$=55.2; p<0.0001 and $F_{5,24}$=49.7; p<0.0001 respectively). RP and horse-and-rider combination have an interactive effect on CSL ($F_{5,24}$=6.21; p<0.0001) and FSL ($F_{5,24}$=3.3; p<0.05) but not HSL (p>0.05). RP significantly affected CSL, with longer strides achieved in the 'light' position. The effect of RP on FSL and HSL was differential. Using objectively measured data this study demonstrated that first, RP has a direct effect on stride and step lengths at canter, and second, RP influences individual horses differently.

Implications for the welfare of the ridden horse

There is a growing awareness of the influence of RP on a horse's way of going in a range of equine disciplines. Appropriate application of RP within different disciplines could enhance the performance of individual horses, and also help to assure their welfare. Understanding the effect of RP is clearly an important consideration in an ethical approach to equitation.

A pilot study of changes in the proximal hoof circumference in response to ridden work in experienced versus inexperienced horses

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Abstract
Hoof shape might help document training responses because specific aspects of hoof shape have recently been shown to be very responsive to changes in exercise regime. This pilot experiment was designed to test the hypothesis that experienced horses accustomed to their work would maintain a consistent response in proximal hoof circumference compared with horses that were inexperienced or recovering from a condition affecting front hoof loading.

The proximal hoof circumference was measured in both front hooves with each horse standing square using a plastic measuring tape in three experienced riding horses before and after their normal ridden work on 2 consecutive days, and a further three unfit horses (two of which were starting their first training to be ridden, while the other was recommencing work after recovering from laminitis). Repeatability coefficients were 1.7mm for the left and 1.8mm for the right (95% CI 1.3 to 2.7 for both).

All the experienced horses showed consistent changes in both days with one hoof showing no change in two horses and a 0.5mm decrease in the third, while their contralateral hoof showed an increase between 1 and 3mm in all horses. In contrast the two inexperienced horses showed different changes in the left hoof between the two days ranging from a decrease of 1mm to an increase of 2mm while the right hoof showed a consistent 1 to 2mm increase in one horse and 1mm decrease in the other. The recovered laminitic horse showed a decrease of 1 and 2 mm in his front hooves the first day and an increase of 2 to 3 mm on the second day.

These differences suggest that the inexperienced horses changed the loading on their left front hooves between different work sessions, and the horse that had recovered from laminitis changed the loading in both front hooves between subsequent work sessions.

Implications for the welfare of the ridden horse
Regular measurements of specific structures in the distal forelimb provide the potential to tailor training to the individual, and to assist in avoiding damage to those structures and to structures elsewhere in the horse.

International competition success: dictating market share

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Abstract
While mainstream agricultural food markets have an inelastic demand, sport horse markets are more responsive to changes in income, with a positive correlation of 0.628 between the national per capita consumption and the number of horses per inhabitants. In economically good times the demand goes up and in bad times the demand drops. However the supply of sport horses is inelastic. The number of animals potentially entering the market place in a particular age group is predetermined by the number of foals born several years previously. Hence so as to facilitate sale, producers of sport horses need to differentiate their product from others in the market place, particularly in an economic downturn. World rankings, through competition performance provide such differentiation. This study set out to assess how market share within the UK show jumping and eventing markets reflect world rankings.

The World Breeders Federations for Sport Horses (WBFSH) issues World studbook rankings. For show jumping in 2008, countries had studbooks ranked in the top 10 as follows; Holland (1), Germany (2,3,4 and 7), France (5), Belgium (6,8,10), Sweden (9). The market share of international breeds within the UK show jumping market was Holland (12.8%), Ireland (9%), Belgium (6.5%), Germany (5%) and France (1.7%).

For eventing in 2008 countries had studbooks ranked in the top 10 as follows: Ireland (1), France (2 and 3), Sweden (4), Germany (5,6,7 and 9), Holland (8) and Belgium (10). The market share of international breeds within the UK eventing market was Ireland (30%), Holland (6.5%), Germany (2.5%), Belgium (2%) and France (1.5%).

The countries with the leading WBFSH studbook in show jumping and eventing are also the countries with the greatest market share in both the UK show jumping and eventing markets. In conclusion, these preliminary findings would suggest that international competition performance facilitates greatest market share of international brands within international markets.

Implications for the welfare of the ridden horse
Poor international competition performance results in smaller international market shares, this combined with decreased domestic demand in an economic downturn could result in over supply and hence potentially serious welfare issues for the horse.

The reality of event horse production

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Abstract
The Irish Sport Horse has commanded huge respect in eventing circles, with the studbook topping the World Breeders Federation of Sport Horse (WBFSH) rankings for 14 years. The production of young horses through competition (training, novice and intermediate levels) has been an acknowledged format for identifying horses with the potential to excel at the highest levels of competition. However increasing production costs may be affecting the profitability of event horse production.

The objective of this study was to quantify the cost of producing event horses. Irish based competitors and event horse producers were surveyed. The return rate was 27% (n= 40 respondents), which represented 13% of the registered riders and 17% of the registered event horse population in Ireland. Details were sought on all expenses associated with the production of 'eventers'. In cases where the horses were subsequently sold, the purchase price, selling price and the average time kept were also recorded.

The findings showed that the mean purchase price for the potential event horses was €3,991(£2,678, SEM 288). The age range for purchase was between 3 and 6 years, with a number purchased younger. The mean time period required for producing the horses to the point of resale was 1.7 years (SEM 0.11). The total mean prize money won per horse during the production period was €150 (£101). However, the total mean production costs for that time frame was €19,147(£12,848, SEM 1036), while the mean selling price was only €12,307 (£8,258, SEM 1695), giving an average net loss of €10,682 (£7,169) or a return of only 54% of the costs. Some respondents were considering leaving the sport due to the increasing expense. In conclusion event horse production is associated in many cases with negative equity.

Implications for the welfare of the ridden horse
Such diminishing returns are changing the clientele of the sport with some of the experienced producers considering quitting. This potential loss of experienced producers could have a detrimental effect on the training of event horses, which could have implications for the safety and welfare of the horse and rider especially when competing on the cross country phase.

A pilot study to quantify the workload of advanced grade dressage horses

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Abstract

Within the lay and scientific literature there has been much debate about training methods for dressage horses. In contrast to the racing industries, with clearly quantifiable measures of training load, there has been little attention paid to the training workload and construction of training programmes for dressage horses. A face to face survey was used to collected data from 22 elite riders identified by Dressage New Zealand. The questionnaire consisted of 20 questions examining horse characteristics, general management, the weekly training programme and components of the training programme and the frequency of competition. The rider completed an attached worksheet (training diary) quantifying typical weekly training activity for their top horse(s). Data were analysed using the general linear model and autocorrelation procedures in SPSS v16. Data were collected from 22 riders and 25 horses (median 9, range 7-17 years old) competing at Medium to Grand Prix level. The horses were predominantly trained on sand based arenas and were worked 6 days per week. The horses were trained for a total of 292±20 minutes per week consisting of 95 ± 7^{ab} min walk, 106 ± 9^{a} min trot , 89 ± 10^{b} min canter, and in the case of one horse 15 min fast work / gallop. When categorised into training intensity the horses spent 68 ± 16^{a} min suppling, 40 ± 17^{b} min long deep and round (n=12 /25) (LDR) and 74 ± 17^{b} min on advanced movements. The use of a semi-quantitative training intensity scale (weighting the time spent on each activity / gait by the relative metabolic cost) calculated that the horses had a total workload of 423±45 min, consisting of 67±7 min walk, 168±18 min trot, and 187±22 min canter. Division of workload by training intensity identified 119 ± 17^{a} min suppling, 157 ± 19^{b} min advanced schooling and 76±21 min LDR. The autocorrelation procedure identified eight horses had no change in the intensity of the workload during the week. The 17 horses with variation in workload had a median 1 day lag (R^2 = -0.58, $p<0.05$) identifying alternate days of hard and lighter work.

Implications for the welfare of the ridden horse

A simple training diary can be used to capture workload data and quantify changes in composition of the training programme. The workload index could be used to quantify workload and improve composition of training programmes to optimise performance and welfare of the competition horse.

Conflict responses exhibited by dressage horses during competition

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Abstract

Oversimplification of the definition of 'normal behaviour' has resulted in a broad misunderstanding of some aspects of equine behaviour. These behaviours have been labelled *abnormal behaviours*, *misbehaviours* or *problem behaviours* and it is often implied that the horse is to blame. In reality, they are merely various expressions of the flight response and are normal, adaptive, behaviours that have evolved to ensure the survival of the domestic horse. This study was performed to identify the most frequently expressed conflict responses and was conducted on dressage horses as the desire for these horses to perform *'willingly'* and *'cooperatively'* with the rider is emphasised more than any other equestrian discipline.

Data were collected at the Dressage NSW Clarendon Event, held at Hawkesbury Showground, Clarendon on Saturday 9th and Sunday 10th August 2008. The event program consisted of nine levels of competition from which eight riders from each level were selected at random, giving a total of 72 horse/rider combinations. Conflict responses were shown at all levels of dressage competition. One way analysis of variance showed that tail swishing was the most frequently exhibited conflict response, followed by ears back, being above the bit, tenseness, teeth visibility, pulling, hollowing of the back and short stiff striding respectively (P=<0.001). Horses at Preliminary level were more likely to be above the bit while those at advanced level were least likely (P=0.003). Horses at Prix St. Georges and Grand Prix put their ears back and swished their tails most frequently while those at Novice level showed these responses least (P=0.041 and P=0.007 respectively). Horses at Preliminary showed more shortening and stiffening of the stride than horses at any other level (P=0.004).

Implications for the welfare of the ridden horse

The identification of these most frequently exhibited conflict responses should prompt equestrians to recognise, appreciate and address these behaviours before they progress into more severe expressions of conflict behaviours. Training programs should place strong emphasis on behaviours as a means of communication and this in turn should contribute to improved sustainability of the equine athlete.

Rider anxiety, perception of equine temperament and ridden performance: Do they relate?

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Abstract
Anecdotal evidence in equestrian sports suggests that rider anxiety and perception of horses' characters can have an effect on horse-rider performance. The present study aims to investigate the effect of intensity and how a rider interprets anxiety and self-confidence on dressage and showjumping performance. Rider perception of equine character traits and the effect on rider anxiety and performance are also investigated.

Twenty-two student riders (6 male, 16 female) competing at an international student competition in dressage and showjumping on previously unfamiliar horses participated in the study. Prior to competing, riders completed the Revised Competitive Sport Anxiety Inventory 2 and indicated whether they perceived levels of anxiety as facilitative or debilitative to performance. Riders also rated their horses' character using a questionnaire based on the Five Factor Model of Personality and including the traits Neuroticism, Extroversion, Openness, Agreeableness and Conscientiousness. Pearson's product moment correlations were used to examine relationships between perception of equine character traits, anxiety and self-confidence intensity and interpretation, and dressage and showjumping performance components. Student's t-tests were used to investigate differences in anxiety, performance and perception scores between genders. In dressage, facilitative interpretations of somatic anxiety, cognitive anxiety and self-confidence was correlated to high horse-rider interaction scores ($r=.44$; $p<0.05$; $r=.42$; $p<0.05$; $r=.48$; $p<0.05$). Perception of horses as agreeable was correlated to less cognitive anxiety ($r=-.56$; $p<0.05$) and also higher dressage style scores ($r=.55$; $p<0.05$). In showjumping, facilitative interpretations of somatic anxiety was correlated to fewer showjumping faults ($r=-.5$; $p<0.05$). Perceptions of horses as neurotic was correlated to debilitative interpretations of somatic and cognitive anxiety. ($r=-.62$; $p<0.01$; $r=-.69$; $p<0.01$) while perceptions of horses as agreeable was correlated to fewer showjumping faults ($r=-.54$; $p<0.05$). Findings clearly indicate that whether riders consider anxiety and self-confidence as facilitative or debilitative has an influence on ridden performance. Perceptions of equine character also seem to influence interpretations of anxiety components and ridden performance.

Implications for the welfare of the ridden horse
Practical implications are that trainers and riders should pay considerable attention to the selection process of suitable horses. Riders should perceive their horses as suitable for them, which is likely to have a positive effect on emotional variables and horse-rider performance.

The role of temperature priming in equitation

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Abstract
Recent studies in human behaviour have shown evidence of temperature priming affecting subsequent responses and reactions between individuals. The exposure to an increase or decrease in body temperature (priming) via the consumption of a hot or cold beverage, respectively, prior to an interaction with another individual highly influences the perceptions that we have of that individual. An increase in temperature makes the individual more receptive and more '*positive*' towards another. The result of a temperature decrease has the opposite effect. Temperature priming may be apparent in other species and may occur as a result of ambient temperature changes in the days prior to testing. The aim of this study was to consider the possibility of temperature priming in horses as examined via the study of dressage test results.

Dressage competitions at Novice level, conducted at the New South Wales Dressage Council grounds of Clarendon in the Western Sydney Basin, were examined over two years (2006/2007). Competitions were conducted in all seasons and consisted of a similar pool of rider/horse combinations. Weather data from the nearby Richmond meteorological station were used to determine if differences in maximum, minimum and mean temperature (degrees C) between the day prior to competition day (D_p) and on competition day (D_c) had any effect on horse and rider performance i.e. D_p - D_c. Differences between maximum and minimum temperatures on the day prior to competition and on competition day had no influence on dressage test scores (DTS). However, linear regression revealed a positive significant ($p=0.02$) relationship was observed when mean temperature differences (MTD) were considered ($DTS=60.8 + 0.4MTD$) such that a warmer day preceding competition increased DTS.

Implications for the welfare of the ridden horse
An understanding of horse's and rider's behaviour as affected by ambient temperature changes has implications for the welfare of the horse. By consideration of long-term weather forecasts, training days may be scheduled to take advantage of positive effects of weather, such that both horse and rider/trainer, maybe more receptive to learning.

Comparison of cortisol and cortisone levels in blood plasma and saliva and cortisol metabolite concentrations in faeces for stress analysis in horses

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Stressful events stimulate adrenal activity and measurement of cortisol in plasma is an accepted parameter to monitor stress in animals. However, collecting blood by venipuncture *per se* is a potential stressor. Determination of cortisol metabolites in faeces (fCM) and cortisol in saliva have been suggested as alternative methods to measure stress in horses. In our study, Shetland stallions (n=11) were exposed to transport (3.5 hrs), isolation (1 h) and to injection of ACTH (250 µg) with the aim to validate non-invasive techniques for cortisol analysis in horses. Saliva and faeces were collected for each test while blood was only collected for the ACTH test. Cortisol, cortisone and fCM were measured by EIA.

ACTH stimulated a clear increase in plasma cortisol concentrations (from 6.4±0.6 to 21.7±1.6, $p<0.001$) and in salivary cortisol (from 0.9±0.1 to 6.3±0.7 ng/ml, $p<0.001$) and in immunoreactive cortisone concentrations (from 26.0±4.9 to 54±6 ng/ml, $p<0.001$). Plasma and saliva cortisol were strongly but not totally correlated ($r=0.705$, $p<0.001$). While in plasma total (bound+free) cortisol is measured, only unbound cortisol appears in saliva. Saliva may thus reflect cortisol activity more precisely than plasma. Although average plasma cortisol concentrations were three times higher than respective values in saliva, the increase in cortisol expressed as percentage of baseline values was more pronounced in saliva (699%) than in plasma (317%) indicating that determination of salivary cortisol is highly sensitive. FCM levels did not change significantly after ACTH injection. In response to transport, saliva cortisol increased from 1.1±0.1 to 3.9±0.4 ng/ml ($p<0.001$). Changes in cortisone were less pronounced. No changes in fCM were found. Isolation did neither increase salivary cortisol nor cortisone nor fCM. Separation thus is not a major stressor in horses remaining in their familiar surroundings.

Implications for the welfare of the ridden horse
Analysis of salivary cortisol concentrations is a reliable and sensitive method to study cortisol release in horses. Determination of fCM was the least sensitive method to detect transient and short-term changes in cortisol release.

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The effects of feeding hay to horses prior to submaximal exercise

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Abstract
Feeding the roughage portion of the diet to horses prior to exercise is known to increase gut fill and gut water reserves. It is not known how this affects performance. Accordingly, 10 horses were used in a Latin square cross-over design experiment to determine the effects of dietary manipulation (inclusion or withholding of hay (H and NH respectively), for 24 hours prior to submaximal exercise) on physiological parameters.

The horses were trained following a 14-week interval training program and were given the same standardised exercise test on weeks 6 (SET1) and 12 (SET2) of the program. Heart rates were recorded during testing and post-exercise blood samples were collected. Differences between the groups were analysed using a two sample paired t-test. V_{200} was calculated using simple linear regression. There were no differences between the groups in plasma lactate concentration, heart rates recorded or V_{200} during SET1, SET2 or between SET1 and 2. There were no differences between the groups of horses for stride lengths during SET1. During SET2, the horses on the H diet had a smaller stride length at 650 mpm than those on the NH diet (P=0.019). The amounts of water consumed before and after SET1 were not different. The horses on the NH diet consumed more water before SET2 (P=0.026) and less water after SET2 than those fed hay (P=0.015).

Implications for the welfare of the ridden horse
Withholding the roughage portion of a horse's ration for 24 h prior to submaximal exercise will not influence its heart rate, blood lactate concentration or V_{200} but will increase its water intake prior to exercise compared with those given their normal hay ration. At speeds of 650 mpm horses fed hay prior to exercise had shorter stride length, which may have implications for horses performing in disciplines where stride length matters e.g. racing, endurance and dressage. This study needs to be repeated to determine the effects of dietary manipulation on maximal exercise, rather than submaximal exercise. It should be noted that horses evolved to live on roughage and thus their welfare will be compromised if given limited access to roughage (e.g. hay).

Management factors influencing the incidence of tying-up in polocrosse horses

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Abstract
Tying-up is a common muscular problem of horses. Its onset involves a combination of factors, making the management of horses succumbing to tying-up challenging. During a polocrosse game, horses can perform at high intensity for up to 36 minutes. Polocrosse horses are considered susceptible to tying-up because their training does not correlate with match conditions. This study explored the training and management of polocrosse horses.

A 25-question survey was distributed to players registered with the New South Wales Polocrosse Association (n=100); 41% were completed. Percentages were calculated as a proportion of the total number of respondents for each response and did not include non-respondents. Data were analysed using pivot tables in Microsoft Excel and then contingency table chi-square analysis was used to identify relationships between pairs of response categories.

Respondent's horses were mostly Australian Stock Horses between 5-15 years old, bay, mares or geldings, 15-15.3 hands high, considered to have a calm temperament and have played up to ten seasons. Polocrosse horses are mostly stabled at night and let into a yard or paddock during the day. They are generally fed equal rations morning and evening, after being worked and at the same times daily. Feeds generally have electrolytes added and are likely to be different for different horses. The ration may not increase with workload. Polocrosse horses usually work for 20-30 min every day, the workload increasing as training progresses. The main suggestions for managing tying-up involved feeding, medication and exercise. Suggestions for the prevention of tying-up focused on balancing feed and exercise, avoiding days off and using feed additives targeting its prevention. The most common frequency for tying-up is once per season. Most respondents were *'greatly concerned'* about the incidence of tying-up and are continually looking for ways to prevent it.

Implications for the welfare of the ridden horse
The frequency of tying-up in polocrosse horses is concerning for the players and ways to reduce its occurrence are sought. Prevention of tying-up in all horses would improve their welfare and thus sustainability as performance horses. Providing feed and exercise according to the horse's needs would undoubtedly assist this, although the exercise intensity requirement of a polocrosse horse must be determined first.

Management routine risk factors associated with handling and stable-related behaviour problems in UK leisure horses

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Abstract

Domestic horses can exhibit a range of unwanted and abnormal behaviours, ranging from biting to stereotypies. The demographic of horse owners is changing towards new and increasingly urbanised leisure owners who may lack the experience to cope with behavioural problems and may have restricted access to land and facilities; both representing potential welfare concerns. A large-scale internet survey was used to quantify the type and prevalence of handling and stable-related behaviour problems within the UK leisure horse population, and to identify associated management routine risk factors. The survey was online for a calendar year and generated data for 1850 individual horses.

Eighty-two percent of horses expressed one or more of 20 common behaviour problems, though the majority were scored as low intensity by their owners. Principle components analysis extracted five clearly defined components, indicating that the behaviour problems were not displayed randomly. These were: handling issues (57% of horses), frustration behaviour (52%), abnormal oral/ingestive behaviour (48%), aggressive behaviour (33%), and locomotor stereotypies (22%). Logistic regression analyses were used to explore associations between each of these behaviour components and management routine. Time spent stabled was associated with an increased risk of handling, oral/ingestive and aggressive problems. The length of time the horse had been at its current home was a risk factor, although the underlying causes are unclear. Features of the turn-out group were risk factors for all behaviour problem components except aggressive behaviour, with an established turn-out group containing 7-9 other horses associated with the least problems. Frustration behaviour had the largest number of associated risk factors and these primarily represented an increased risk when full social contact was thwarted in the field and stable.

Implications for the welfare of the ridden horse

Handling and stable-related behaviour problems are highly prevalent within UK leisure horses, albeit at low intensities. Time at grass and the opportunity to form proper social relationships are key risk factors, with traditional stabling practices at odds with these. The increasing urbanisation of leisure horses must be addressed by management practices, such as group housing, that permit full social relationships when turn-out is limited.

Effects of different forms of exercise on post-inhibitory rebound and unwanted behaviour in stabled horses

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Abstract

The stable provides horses and their carers with a protected and controlled environment but it restricts the opportunity for exercise. Our objectives were firstly to examine post-inhibitory increase in locomotor behaviour (termed rebound) in horses following four exercise regimes and to determine if regular exercise reduced the occurrence of unwanted behaviour (such as rearing, backing and head tossing) compared to un-exercised control treatments.

Twenty-four stabled horses were assigned to one of four exercise regimes – walker, treadmill, turn-out and riding - for one hour per day for four consecutive days. Turn-out provided significantly less exercise than the other three treatments ($P<0.01$). Because these forms of exercise provide additional environmental stimulation, beyond that provided by exercise per se, each horse served as its own control in four corresponding (un-exercised) control treatments. Three replicates of 8 horses were conducted with each horse presented with one of four exercise regimes and the corresponding controls presented sequentially in a balanced order. Unwanted behaviour was tested by routine handling by an experienced handler, and the rebound effect was tested by releasing them into a large (80 x 80 m) arena for a period of 15 minutes at the end of the exercise and control treatments. Locomotor activities made up a large part of behaviour in the large arena but all exercise regimes were sufficient to reduce the amount of walking ($P<0.05$), trotting ($P<0.01$) and cantering ($P<0.001$) compared to control treatments. Turn-out reduced bucking ($P<0.01$) and rolling ($P<0.05$) during rebound tests. This suggests that an unrestricted form of exercise (turn-out) has a stronger effect than more restricted forms of exercise. Exercise regimes reduced unwanted behaviour and the number of commands given by the handler during weighing (both $P<0.05$) but had no effect on these behaviours during loading onto a float.

Implications for horse welfare and rider safety

We conclude that providing stabled horses with one hour per day of exercise on a walker, treadmill, turn-out or by being ridden are all effective at allowing expression of locomotor activities in stabled horses and are likely to provide positive effects on horse welfare, training ability and handler safety.

Horse health and well-being as a motivational driver for land management improvements

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Abstract
Motivational drivers to engage horse owners in the voluntary adoption of improved land management practices has underpinned extension programs linking environmental benchmarks to horse keeping. The historic relationship between the horse owners and regulatory bodies can be described as challenging, especially where the city and country interface. In recent years, this has seen the enforcement of strong planning regulations shifting horse keeping from within townships to special regulatory zones.

There are a range of environmental, financial and community (social) drivers that influence to what level an individual or organisation will do to voluntarily promote the keeping of horses in an environmentally sustainable manner. The primary driver is horse welfare.

HorsesLandWater has expanded from the pilot research project based in Adelaide to all states of Australia, including adaptations for tropic and arid regions. This has been achieved through fostering leadership within the horse industry to support a geographical spread of key messages. Simultaneous engagement of all levels of government has also proved effective. The Rural Industries and Research Development Corporation (RIRDC) funded the development of the HorsesLandWater Action Planner which set environmental goals for horse property managers. The applied framework used throughout the project is modelled according to the basic elements of International Standardisation Organisation (ISO) 14001's EMS methodology. This provides a systematic approach to capture the potential risks of horse management activities to the environment; to prioritise tasks to reduce environmental damage associated with these risks; and to monitor the success of the on-property action(s) with the implied option of continuous improvement.

Implications for the welfare of the ridden horse
Development (infrastructure), Natural Resources (environment), and Management (horse care routines) play a pivotal role in the baseline health and well-being of the ridden horse.

The preliminary use of accelerometry for the quantification of oral stereotypic behaviour in the domestic horse *(Equus caballus)*

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Abstract
Stereotypic behaviours in domestic horses are usually recognised as repetitive movement patterns without apparent functionality. Their emergence has been associated with compromised welfare. Their measurement in ethological studies is usually subjective and so is limited to an individual observer's perception of movement. Furthermore, where video capture is not available, an observer in close proximity to the horse is likely to influence the horse's performance of stereotypies.

Accelerometry, quantitative determination of acceleration of an object during movement in various planes (i.e. X, Y and Z-axes), offers a practical method of objectively assessing movement. Being small, accelerometers can be securely placed on various locations on horses.

The aim of the current study was to determine the feasibility of the use of accelerometry to record the repetitive movement patterns of horses during crib-biting (a stereotypy characterised by grasping of a fixed object by the incisor teeth, arching the neck and emitting a grunt). Crib-biting (also known in Australia as wind-sucking) was chosen because of the characteristic arching of the neck. A tri-axial accelerometer with accompanying data logger was secured for 10 min in various locations (lower mandible, C1, T9-T10 and C4-C5) on crib-biters (n=2).

Clear trace patterns were recorded from each site on the horses, with the lower mandible providing the most distinctive movement pattern and the thoracic site having the least distinctive pattern. The mean duration of a crib-bite event was 2.32 s. The X-axis maximum peak positive and negative readings were 0.49 and -1.18 ms^{-2} (where ms^{-2} is its acceleration relative to free-fall) respectively; the Y-axis maximum peak positive and negative readings were -0.49 and -1.86 ms^{-2} and the Z-axis maximum peak positive and negative readings were -10.59 and -11.38 ms^{-2}.

Implications for the welfare of the ridden horse
The welfare of horses may be advanced by more widespread measurement of the triggers and risk factors for stereotypies. The present study has revealed that accelerometry can provide an objective, reliable, low-cost, practical means of measuring stereotypic movements. It may improve the study of stereotypies by reducing dependence on subjective methods.

The effects of human body posture on the flight behaviour of naïve ponies

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Abstract
The body posture adopted by a handler towards a horse is an explicit consideration in what has been called 'natural horsemanship'. For example, Monty Roberts claims that approaching naïve horses face-on, body tense and with direct eye contact ('Hard') encourages them to flee, whereas approaching with the body at 45º, relaxed and not looking directly at the horse ('Soft') invites contact. Our aim was to determine the effects of such body postures on alarm and flee behaviour of relatively unhandled ponies.

Thirty-six loose housed, semi-feral Welsh mountain ponies (26 colts and 10 fillies) aged 6-9 months were used in two experiments. All testing was conducted in the ponies' home barn in unique groups of two or three, with data recorded from the lead pony in each group. A small amount of concentrate feed pooled on the straw attracted the ponies and allowed standardised start conditions for each trial.

Our first experiment supported the general hypothesis that 'Hard' approach elicited earlier alert responses and greater flee distance than 'Soft' (N=10, counterbalanced within subjects, paired t-tests $P \leq 0.020$), and we noted a tendency for greater speed of advance when adopting a 'Hard' approach.

Our second experiment used counterbalanced between-subjects to test the separate effects of tense/relaxed posture (N=18/17) and eye gaze on/off (N=15/20); and used within-subjects (slow then fast) to test the effects of speed of approach (N=35). Posture had no effect on the ponies' responses; eyes off elicited earlier alert responses (independent t-tests, $P \leq 0.003$), but had no effect on flee distance; and speed of approach had no effect on alert responses, but triggered greater flee distance (paired t-test, $P \leq 0.001$).

These experiments showed that the ponies reacted with alarm earlier and fled further from 'Hard' approaches, but that earlier alarm responses were not due to eye contact and flee distances were affected only by speed of approach.

Implications for the welfare of the ridden horse
Despite the emphasis placed on body posture and eye contact in 'natural horsemanship' practices, it is the accompanying variation in the handler's speed of approach that is the key influence on flight behaviour in horses.

An investigation into perceived differences in character between horses and ponies

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Abstract

Equines are commonly divided into horses and ponies with ponies being classified as no taller than 148cm and possessing a number of different character traits than horses, making ponies more or less suitable for certain tasks or disciplines. However, to date no research exists investigating whether such a difference in character really exists. The current study aims to investigate the perceived differences in character traits between horses and ponies.

An online questionnaire was placed on an internet forum for equine enthusiasts. Subscribers to the forum who owned or cared for one or several horses or ponies were invited to participate in the study. They were asked to score their equine for 20 character traits: active, aggressive, careful, cooperative, curious, fearful, hard-working, hot, insecure, lazy, playful, quiet, reliable, sensitive, smart, social, stubborn, submissive, tense, and unpredictable.

In total, 494 respondents completed the survey. Two-way between-subjects MANOVA tests were used to examine gender-by-classification interactions for perception of equine character scores. Post hoc analysis was conducted independently for each character trait using one-way univariate ANOVA tests. An alpha level of 0.05 was used to indicate statistical significance and partial eta squared effect sizes (partial η^2) were calculated for significant results.

A gender main effect was found for perception of equine character traits ($F_{40,938}$=2.8, P<0.001, partial η^2=0.1) but there was no classification main effect ($F_{20,469}$=1.2, P>0.05) or gender-by-classification interaction ($F_{40,938}$=1.1, P>0.05). When the results for the dependent variables were considered separately, the only differences to reach statistical significance using a Bonferroni adjusted alpha-level of .0025 were for the perceived character traits of “active” ($F_{5,488}$=.89, p=0.001) and “lazy” ($F_{3,488}$=.85, p=0.002). Inspections of the mean scores revealed that stallions are perceived as more active and less lazy than mares and geldings.

Implications for the welfare of the ridden horse

There are no perceived differences in character between horses and ponies, suggesting that suitability for different ridden tasks should be made on the basis of individual suitability. From a welfare perspective, findings indicate that horses and ponies should be treated equally, and on the basis of ethological needs rather than on the premise of whether they are “horses” or “ponies”.

Mare and foal recognition after a prolonged period of separation

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Abstract
Horses in groups form dominance hierarchies. Within these, pair bonds also commonly arise. In domestic situations, mares and foals will usually be weaned. The behavioural responses exhibited by both mares and foals at weaning suggest that separation anxiety may be experienced by each. What happens to the mare-foal bond after this separation is unknown. Anecdotal reports suggest that related horses will recognise each other when reunited after a prolonged period of separation. This could facilitate herd management of horses when they are subsequently housed together by having pair bonds form more rapidly and with less agonistic interactions. Therefore this study aimed to determine whether or not mares and young horses (< 3 yrs) appear to recognise each other after a period of prolonged separation (17.23 ± 1.50 months).

Ninety mare-young horse dyads (70 unrelated; 20 related) were each placed into a round-yard and their interactions video-taped for 15 min. One-way analysis of variance indicated that the distance between the dyads immediately prior to agonistic interactions was greater for related than non-related dyads (8.25 and 5.70 ± 1.16 m respectively; P=0.030). Investigative approaches occurred more within related than unrelated dyads (P=0.018). Youngsters of related dyads were more likely to exhibit snapping than those of unrelated dyads (P=0.001). There was no difference between the related and unrelated dyads for the responses of head lowering, head shaking, licking the lips, snorting, vocalising and yawning. Being related had no influence on whether or not agonistic interactions were exhibited, the time the dyads spent in close proximity or which member of the dyad made the initial approach to the other.

Implications for the welfare of the ridden horse
Given that related dyads were more likely to exhibit investigative approaches it would seem that related horses do recognise each other after a prolonged period of separation. Therefore management of groups of horses could be improved when related horses are subsequently housed together. While agonistic encounters occurred in all dyads, unrelated dyads had less distance between them than related dyads prior to their occurrence. This could suggest that members of related dyads may be less likely to suffer injury than those of non-related dyads.

APPENDICES

Glossary

Catenary: The slight loop in a perfectly flexible and inextensible rope or chain of uniform cross-section and density as it hangs freely from two fixed points that are not in the same vertical line. The term is used in discussions of rein tension.

Classical conditioning: The process whereby the unconditioned or conditioned response becomes elicited from a conditioned stimulus (Pavlov, 1927). In equitation it is the process where learned responses are elicited from more subtle versions of the same signal or to entirely new signals.

Conflict behaviour: A set of responses of varying duration that are usually characterised by hyper-reactivity and arise largely through confusion. In equitation, confusions that result in conflict behaviours may be caused by application of simultaneous opposing signals (such as go and stop/slow/step-back) such that the horse is unable to offer any learned responses sufficiently and is forced to endure discomfort from relentless rein and leg pressures. Attempts to flee the aversive situation result in hyper-reactivity. In addition, the desired response to one or both cues diminishes. Conflict behaviours may also result from one signal eliciting two or more responses independently, such as using the reins to achieve vertical flexion independently of the stop/slow/step-back response, or using a single rein to bend the neck of the horse independently of its previously conditioned turn response. Similarly, conflict behaviour may result from incorrect negative reinforcement, such as the reinforcement of inconsistent responses, incorrect responses, no removal of pressure, or no shaping of responses. Often referred to as evasions and resistances.

Contact: The connection of the rider's hands to the horse's mouth, of the legs to the horse's sides, and of the seat to the horse's back via the saddle. The topic of contact with both hand and leg generates considerable confusion related to the pressure that the horse should endure if the contact is deemed to be correct. In classical equitation, contact to the rein and rider's leg involves a light pressure (approximately 200g) to the horse's lips/tongue and body, respectively. Although a light contact is the aim, there are brief moments (seconds or parts of a second) when contact may need to be stronger, particularly at the start of training, or in re-training, to overcome resistances from the horse. Many contemporary horse trainers insist that the contact should be much heavier than a light connection. This view may cause progressive habituation leading to learned helplessness to the rein and leg signals as a result of incorrect negative reinforcement and/or simultaneous application of the cues. Contact may therefore need to be the focus of discussion and debate.

Cue: An event that elicits a learned response. In equitation, cues are sometimes termed aids or signals. Rein, leg, whip and spur cues are initially learned through negative reinforcement and then transformed to light cues (light rein, light leg, voice, seat) via classical conditioning because of the temporal relation between the two. In traditional horsemanship, the cues are divided into two groups: the natural cues and the artificial cues. This distinction is misleading as it neither identifies nor correlates with the two different learning modalities through which the horse acquires its responses to the cues. These are learned through classical conditioning when a response comes increasingly under stimulus control.

Ethology: Ethology is primarily the scientific study of innate adaptive behaviour in animals, as it occurs in a natural environment; applied ethology being is the study of animal behaviour in the human domain.

Habituation: The waning of a response to a repeated stimulus as a result of frequent exposure (not fatigue).

Learned helplessness: A state in which an animal has learned not to respond to pressure or pain. This arises from inappropriate application of negative reinforcement, which results in the horse not being able to obtain release from aversive stimuli. If this continues over a period of time, the horse will no longer make responses that were once appropriate. Learned helplessness has the following characteristics: a disinclination to trial behavioural responses to pressure; lowered levels of aggression; dullness; loss of appetite; physiological and immunological changes.

Negative punishment: The *removal* of a reinforcing stimulus which makes a particular response less likely in the future.

Negative reinforcement: The *subtraction* of something aversive (such as pressure) to reward the desired response and thus lower the motivational drive (Skinner, 1953).

Operant conditioning: Training the horse to respond consistently to signals through positive reinforcement and negative reinforcement (Skinner 1938; McLean 2003).

Positive punishment: The *addition* of an aversive stimulus which makes a particular response less likely in the future.

Positive reinforcement: The *addition* of a pleasant stimulus (a reinforcer) to reward the desired response and thus make this response more likely in the future (Skinner, 1953; McLean, 2003).

Punishment: The presentation of an aversive stimulus that decreases the likelihood of a response or, in the case of negative punishment, the *removal* of a reinforcing stimulus. Punishment is often used incorrectly in horse-training i.e., when not immediately contingent with the offending response. Incorrect use of punishment can lower an animal's motivation to trial new responses, desensitise the animal to the punishing stimulus and create fearful associations (Mills, 1998).

Reinforcement: The process in which a reinforcer follows a particular behaviour so that the frequency (or probability) of that behaviour increases (Wolpe, 1958; McGreevy, 2004).

Reinforcer: An environmental change that increases the likelihood that an animal will make a particular response, i.e., the *addition* of a reward (positive reinforcer), or *removal* of an aversive stimulus (negative reinforcer).

Response: A reaction to a stimulus.

Shaping: The successive approximation of a behaviour toward a targeted desirable behaviour through the consecutive training of one single quality of a response followed by the next. In horse-training, a shaping program is known as a Training Scale. Not paying due attention to shaping in horse-training has been associated with conflict behaviours (Morgan, 1974; McLean, 2003).

Stereotypy: A repeated, relatively invariant sequence of movements that has no function obvious to the observer. A number of stereotypic behaviours are seen in horses and are erroneously referred to as stable vices. Crib-biting is where the horse is holding onto a fixed object with the incisor teeth, arching the neck and leaning backwards, with or without engulfing air with a characteristic grunting noise; in the US it is referred to as cribbing. Wind-sucking, in Australia, describes a stereotypic gripping of a fixed object with the teeth while pulling back and engulfing air into the cranial oesophagus whereas in the UK it refers to the gulping of air into the cranial oesophagus without holding onto any fixed object (McGreevy 2004).

Stimulus: Any of the cues or signals used to elicit responses in horses. Often referred to as aids.

Stress (acute and chronic): Stress, in its acute form, is a short-term dysfunction of the signal-response relationship presenting variously as raised tension levels, agonistic behaviours, redirected aggression and displacement activities. Chronic stress manifests as raised corticosteroid levels, physiological disturbances, gastric pathology, repetition and ritualisation of original conflict behaviours, redirected, ambivalent and displacement behaviours, development of stereotypies and injurious behaviours, such as self-mutilation and increased aggression (Wiepkema, 1987; Moberg and Mench, 2000).

Training scale: A progressive order of training particular qualities of responses through the process of shaping. Shaping programs merit further research.

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Sponsor websites

Rural Industries Research and Development Corporation (RIRDC)	http://www.rirdc.gov.au/
Ranvet	http://www.ranvet.com.au/
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Australian Equine Behaviour Centre	http://www.aebc.com.au/home
Wintec	http://www.wintec.net.au/
ProVet	http://www.provet.com.au/
Horse Connections	http://www.horse-connection.com.au/
Waltham	http://www.waltham.com/index.html

What is science and why do we need it?

Science is an activity that sets out to explain how our world works. Scientists make observations, create hypotheses and then use experiments to test whether the hypotheses are correct. They like to measure things (through experimentation) and check (through statistical analysis) that their measurements are not mere coincidence. This is how science can bust myths. Animal welfare science and equitation science allow us to measure how animals respond to various challenges and what they value. They ensure that we avoid making the wrong assumptions about animal well-being.

Training relies on timing and consistency and so, by deduction, detraining soon arises when there is inconsistency and variable timing. The best horse-trainers are consistent in their signals and the way in which they set up puzzles for the horse to solve (i.e. the way in which they pose the questions). Good technique that reflects these qualities is more sustainable than a handler's size or strength or indeed any device that allows a handler to use more force.

Humans must never forget that the horse's welfare is paramount: it is a privilege to ride horses and remarkable that the possibility exists. Therefore, every horse-trainer should maintain an open mind about possible limitations in horse learning and confusion arising from training methods. This is especially important when the vast range of required responses in the trained horse is compared with the limited number of sites on the animal's body for eliciting those responses. Given that we are dealing with an animal that, so far at least, appears unable to extrapolate, we must always be mindful of the potentially confusing effects of applying pressure signals in common or overlapping sites on its body to elicit different responses. Much of the appalling 'behavioural wastage' tragedy in the horse industry is a result of our unclear interactions and the impossible expectations humans place on horses. What is needed, therefore, is a reappraisal and restructuring of contemporary horse-training within the framework of established and empirically tested principles of learning; and that is the whole purpose of Equitation Science.

This nascent discipline aims to provide an understanding of the behavioural mechanisms that underpin the human–horse interface. Equitation Science is the measurement and interpretation of interactions between horses and their riders. By harnessing objective measurement of variables, Equitation Science examines traditional and novel techniques to reveal what works, what does not, and why. Most importantly, it also explores the welfare consequences of training and competing with horses under different disciplines. This means that horses are not confused, abused or trained against a background of unrealistic expectations.

A quick guide to statistics for non-scientists

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This guide is intended to enable non –scientists to understand the statistical references made in the abstracts and presentations.

The 'scientific process' comprises the six steps listed below. The application of statistics enables reliable conclusions to be reached and the answering of the research objective. Statistics are not all that difficult to understand and simply involve following a series of steps and rules. Here is an example to demonstrate the steps needed for a simple scenario in which the researcher needs to assess the difference between two sets of data.

EXAMPLE. A study is planned to investigate the success of dressage horses trained using two different training methods (Method A and Method B).

1. **Generating a research question**
   A good project will have a simple title which clearly describes the objective of the study.

   Is there a difference in the success of dressage horses trained using Method A and Method B?

2. **Identifying variables and measures**
   There are two types of variables – independent variables which are determined by the researcher and dependent variables which provide the measurements upon which the statistical test are conducted.

   The Independent Variable is 'Training method' and has two levels (Method A and Method B)
   The Dependent Variable is 'success' – which can be measured by scores achieved in competition.

3. **Formulating hypotheses**
   All research projects examine a pair of hypotheses simultaneously which are in effect opposite to each other and follow a standard format:
   - The Null Hypothesis (Ho) states that *'There is no significant difference between A and B'*.
   - The Alternative Hypothesis (Ha/H1) states that *'There is a significant difference between A and B'*.

   Ho: There is no significant difference in the dressage scores achieved by horses trained using Method A and the dressage scores achieved by horses trained using Method B.
   Ha: There is significant difference in the dressage scores achieved by horses trained using Method A and the dressage scores achieved by horses trained using Method B.

4. **Designing the experiment ~ data collection**
   When designing an experiment it is important to obtain a decent sample size (designated by the symbol "n"; e.g., n=6 tells you that there were six horses in the group) and to match everything about the individuals contributing to each sample as evenly as possible.

   All of the horses (and riders) in this study competed at a similar level, and performed the same dressage test, under the same conditions, judged by the same judge.

5. **Data analysis**
   Two types of data analysis are applied.
   1. Exploratory, descriptive analysis which yields averages and an indication of the spread of the

data

2. Confirmatory statistical analysis which yields 'test statistics' and probabilities, and ultimately allows a statistical conclusion to be reached.

Sample data (Dressage scores, %)									
Method A									
60	60	60	50	64	56	55	56	48	44
58	51	57	56	61	55	50	58	56	52
62	53	67	52	59	53	53	59	54	52
Method B									
60	73	69	67	72	67	65	64	64	72
70	74	61	63	66	68	66	72	70	68
64	72	61	68	68	55	87	60	66	69

Exploratory, descriptive analysis of the sample data shows that horses trained using Method A achieve an average score of 55.7% with a variability of 4.93%. This is typically presented as 55.7±4.93%. In contrast, horses trained using Method B achieved a higher score of 67.4±5.80%.

At this point, the general impression is gained that there is a difference in the scores achieved by horses trained using the two different training methods.

Confirmatory, statistical analysis is necessary in order to reach a reliable conclusion. A standard process is now followed:
Conduct a statistical test (here the appropriate test is a two sample the-test). This will produce a test statistic and a probability value, P.

For this example: $t_{56}=8.40$; $P<0.001$

6. **Reach a conclusion**

In statistics, there is a one important number: P=0.05.

A P value of 0.05 means that if a study was repeated 100 times the probability is that 95 times out of 100 the same result would be found, and 5 times out of 100 the opposite result would be gained. As far as interpretation of results goes, the P value should be less than 0.05 for the results to be considered to be reliable.

A simple procedure is followed to relate the P value to the hypotheses in order to reach a statistically sound conclusion:

- If the P value obtained is less than 0.05, the Ha is accepted and the Ho is rejected. The conclusion can then be reached that there is a significant difference between the two samples. The averages found in exploratory data analysis show that training Method B is more successful than Method A.
- If the P value obtained is equal to, or greater than, 0.05, the Ho is accepted and the Ha is rejected. The conclusion can then be reached that there is not a significant difference between the two samples.

University Map