FONDAZIONE INIZIATIVE ZOOPROFILATTICHE E ZOOTECNICHE BRESCIA - ITALY

UNIVERSITÀ DEGLI STUDI DI MILANO

PROCEEDINGS OF THE 2nd INTERNATIONAL EQUITATION SCIENCE SYMPOSIUM

Tuesday 19th and Wednesday 20th September, 2006
Veterinary Faculty of Milano, Italy

Editors:
M. Minero, E. Canali, A. Warren-Smith, A. McLean, D. Goodwin, M. Zetterqvist, N. Waran, P. McGreevy

EDITO A CURA DELLA
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E ZOOTECNICHE - BRESCIA

65

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EQUITATION SCIENCE SYMPOSIUM

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26 - 1990 Riproduzione nella specie suina
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33 - 1992 Allevamento e malattie del visone
34 - 1993 Atti del XIX Meeting annuale della S.I.P.A.S., e del Convegno su Malattie dismetaboliche del suino
35 - 1993 Stato dell'arte delle ricerche italiane nel settore delle biotecnologie applicate alle scienze veterinarie e zootecniche - Atti 1ª conferenza nazionale
36 - 1993 Argomenti di patologia veterinaria
37 - 1994 Stato dell'arte delle ricerche italiane sul settore delle biotecnologie applicate alle scienze veterinarie e zootecniche
38 - 1995 Atti del XIX corso in patologia suina e tecnica dell'allevamento
39 - 1995 Quale bioetica in campo animale? Le frontiere dell'ingegneria genetica

40 - 1996 Principi e metodi di tossicologia in vitro
41 - 1996 Diagnostica istologica dei tumori degli animali
42 - 1998 Umanesimo ed animalismo
43 - 1998 Atti del Convegno scientifico sulle enteropatie del coniglio
44 - 1998 Lezioni di citologia diagnostica veterinaria
45 - 2000 Metodi di analisi microbiologica degli alimenti
46 - 2000 Animali, terapia dell'anima
47 - 2001 Quarantacinquesimo della Fondazione Iniziative Zooprofilattiche e Zootecniche di Brescia, 1955- 2000
48 - 2001 Atti III Convegno Nazionale di Storia della Medicina Veterinaria
49 - 2001 Tipizzare le salmonelle
50 - 2002 Atti della giornata di studio in cardiologia veterinaria
51 - 2002 La valutazione del benessere nella specie bovina
52 - 2003 La ipofertilità della bovina da latte
53 - 2003 Il benessere dei suini e delle bovine da latte: punti critici e valutazione in allevamento
54 - 2003 *Proceedings of the 37th international congress of the ISAE*
55 - 2004 Riproduzione e benessere in coniglicoltura: recenti acquisizioni scientifiche e trasferibilità in campo
56 - 2004 Guida alla diagnosi necroscopica in patologia suina
57 - 2004 Atti del XXVII corso in patologia suina e tecnica dell'allevamento
58 - 2005 Piccola storia della Medicina Veterinaria raccontata dai francobolli
59 - 2005 IV Congresso Italiano di Storia della Medicina Veterinaria
60 - 2005 Atti del XXVIII corso in patologia suina e tecnica dell'allevamento
61 - 2006 Atlante di patologia cardiovascolare degli animali da reddito
62 - 2006 50° Fondazione Iniziative Zooprofilattiche e Zootecniche di Brescia, 1955- 2005
63 - 2006 Guida alla diagnosi necroscopica in patologia del coniglio
64 - 2006 Atti del XXIX corso in patologia suina e tecnica dell'allevamento

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CONTENTS

PROCEEDINGS

Scientific committee

M. Minero, E. Canali, A. Warren-Smith, A. McLean, D. Goodwin, M. Zetterqvist, N. Waran, P. McGreevy

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PROGRAMME

TIMETABLE

Tuesday 19th September	
08.30	Registration and Poster set-up
09.30	Congress Opening
	Ethological solutions in horse training Chair: D. Goodwin
10.00	**N. Waran.** Training from an earlier age
10.40	**P.D. McGreevy.** Ethological challenges for the working horse and the limitations of ethological solutions in training
11.00	Coffee break and **posters**
11.30	**A.K. Warren-Smith.** An audit of the application of the principles of equitation science by qualified equestrian instructors in Australia
11.50	**J.W. Christensen.** Training methods for modification of fear in horses
12.10	**A.N. McLean**. Reducing wastage in the trained horse: training principles that arise from learning theory
12.30	**E. Hartmann.** A preliminary investigation into verbal cue-colour association learning in horses
12.50	Lunch break
14.00	transport to Carpiano
14.30 - 18.00	Practical session at the Stable Rosenthal (Carpiano). **Ethology in practise: science and equitation together** Chair: A.N. McLean
19.00	Social dinner
Wednesday 20th September	
	Assessing the benefits of adopting a scientific approach to behaviour modification of horses Chair: P.D. McGreevy
09.00	**H.D. Randle.** Horse Whisperers and Horse 'Behaviourists': are we jeopardising our horses?
09.20	**J. Hockenhull.** Does Punishment Work? Rider responses and behaviour problems in ridden horses
09.40	**P. Baragli.** Assessment of the behaviour and haltering work time in young unhandled horses: influence of three different training methods
10.00	**M. Zetterqvist Blokhuis.** HorseConnexion: improving horse welfare through knowledge transfer to riders, riding teachers and horse owners
	Motor influences on ridden horses Chair: A.N. McLean
10.20	**A.E.D. Wells.** Do horses exhibit motor bias when their balance is tested?
10.40	**J. Murphy.** Visuomotor influences on jump stride kinematics in showjumping horses

11.00	Coffee break and **posters**
	Indicators and effects of stress in riding horses Chair: E. Canali
11.30	**M. VanDierendonck.** Assessment of ethological methods as a diagnostic tool to determine early overtraining in horses
11.50	**A. Falaschini.** An approach to stress induced by rider in show jumper horses
12.10	**U.U. von Borstel.** Stronger fear reactions in Dressage versus Showjumping horses may be linked to genetics but not training
12.30	**A. Górecka.** Behaviour of horses during habituation to a novel object
12.50	Lunch break
14.00	**Where next? A metha-plan discussion on immediate priorities of research** Chair: J. Ladewig
15.00	Coffee break
15.30	**Where next? A metha-plan discussion on immediate priorities of research (part II)**
16.30	Closing of IESS 2006

POSTER SESSION

Poster n. 1	**S.E. Burr.** Dancing with horse whisperers: What horse(wo)men want
Poster n. 2	**J. Ladewig**. Roll and Rise: A Sign of Comfort in Horses?
Poster n. 3	**B.C. Bliss.** A preliminary 2-foal study on the use of Positive Reinforcement from birth
Poster n. 4	**A. E. Minetti.** General and individual biomechanics/energetics of locomotion in performing quadrupeds
Poster n. 5	**A. Brunt.** Responses of school horses to a flat lesson
Poster n. 6	**C. Cravana.**Circulating β-endorphin levels of trained Standardbred racehorses after competitive and not competitive races
Poster n. 7	**M. Zetterqvist Blokhuis.** EuroRide – an international education for riding instructors
Poster n. 8	**L.A. Roberts.** A Pilot Study: Can owners predict their horses' behaviour?
Poster n. 9	**A. Checchi.** Safety compliances in equestrian centers
Poster n. 10	**A. Fagiolo.** Training, competition and transport in horses: influence on physiological and biochemical parameters.
Poster n. 11	**M. Pauri.** The use of an experienced horse in breaking of an untrained subject: preliminary observations

PROGRAMMA

Martedì 19 settembre	
08.30	Registrazione e posizionamento dei poster
09.30	Apertura dei lavori
	Soluzioni etologiche per l'addestramento dei cavalli Chair: D. Goodwin
10.00	**N. Waran.** L'addestramento in età precoce
10.40	**P.D. McGreevy.** I limiti etologici nell'addestramento dei cavalli
11.00	Pausa caffè e **poster**
11.30	**A.K. Warren-Smith.** Un audit sull'adozione dei principi scientifici dell'equitazione da parte degli istruttori qualificati in Australia
11.50	**J.W. Christensen.** Metodi di addestramento per diminuire le reazioni di paura
12.10	**A.N. McLean**. I principi di addestramento che permettono di ridurre il numero di cavalli scartati
12.30	**E. Hartmann.** La capacità dei cavalli di apprendere le associazioni di parole e colori
12.50	Pausa pranzo
14.00	Trasporto a Carpiano
14.30 - 18.00	Sessione pratica alla scuderia Rosenthal (Carpiano). **Etologia in pratica: scienza ed equitazione insieme** Chair: A.N. McLean
19.00	Cena sociale
Mercoledì 20 settembre	
	I benefici di un approccio scientifico nell'eliminazione dei comportamenti indesiderati dei cavalli Chair: P.D. McGreevy
09.00	**H.D. Randle.** Sussurratori e comportamentisti: stiamo mettendo a rischio i cavalli?
09.20	**J. Hockenhull.** Le punizioni funzionano? Comportamento dei cavalieri e problemi dei cavalli montati
09.40	**P. Baragli.** Valutazione del comportamento di puledri addestrati con tre metodi differenti
10.00	**M. Zetterqvist Blokhuis.** HorseConnexion: come migliorare il benessere dei cavalli attraverso il trasferimento delle conoscenze a cavalieri, istruttori e proprietari
	Influenze motorie sul comportamento dei cavalli montati Chair: A.N. McLean
10.20	**A.E.D. Wells.** I cavalli sono sbilanciati quando viene verificato il loro equilibrio?
10.40	**J. Murphy.** Influenze visive e motorie sulla cinematica del salto

11.00	Pausa caffè
	Indicatori ed effetti dello stress nei cavalli Chair: E. Canali
11.30	**M. VanDierendonck.** Un metodo etologico per diagnosticare l'overtraining precoce nei cavalli
11.50	**A. Falaschini.** Lo stress indotto dai cavalieri sui cavali da concorso
12.10	**U.U. von Borstel.** Le più intense reazioni di paura dei cavalli da dressage rispetto ai cavalli da concorso sono dovute alla genetica o all'addestramento?
12.30	**A. Górecka.** Comportamento dei cavalli di fronte ad oggetti sconosciuti
12.50	Pausa pranzo
14.00	**Verso dove? Una discussione con il metodo metha-plan sul futuro della ricerca di settore** Chair: J. Ladewig
15.00	Pausa caffè
15.30	**Verso dove? Una discussione con il metodo metha-plan sul futuro della ricerca di settore (parte II)**
16.30	Chiusura dei lavori di IESS 2006

POSTER

Poster n. 1	**S.E. Burr.** Ballando con i sussurratori: che cosa vogliono donne e uomini?
Poster n. 2	**J. Ladewig**. Rigirarsi e alzarsi: un segno di benessere nei cavalli?
Poster n. 3	**B.C. Bliss.** Studio preliminare sull'uso dei rinforzi positivi sin dalla nascita
Poster n. 4	**A. E. Minetti.** Biomeccanica/energetica generale ed individuale della locomozione dei quadrupedi
Poster n. 5	**A. Brunt.** Risposte dei cavalli da scuola ad una lezione di equitazione di base
Poster n. 6	**C. Cravana.** β-endorfine circolanti nei trottatori dopo corse non competitive e competitive
Poster n. 7	**M. Zetterqvist Blokhuis.** EuroRide – educazione internazionale per gli istruttori di equitazione
Poster n. 8	**L.A. Roberts.** Studio pilota. I proprietari sono in grado di predire il comportamento dei loro cavalli?
Poster n. 9	**A. Checchi.** Il rispetto delle norme di sicurezza nei centri equestri
Poster n. 10	**A. Fagiolo.** Addestramento competizione e trasporto dei cavalli: influenze su parametri fisiologici e biochimici
Poster n. 11	**M. Pauri.** L'uso di un cavallo esperto come aiuto nella doma: osservazioni preliminari

WELCOME

Welcome to the 2nd International Equitation Science Symposium (IESS 2006)!

IESS are primarly centred on the improvement of horse welfare through the dissimination of scientific knowledge in equitation. The symposium is open to a wide audience of equine scientists, veterinarians, ethologists, behaviour therapists, riding teachers, riders and horse owners. The numerous oral and poster communications speak about a lot of themes of equitation science: the use of ethological solutions in horse training, assessing the benefits of adopting a scientific approach to behaviour modification of horses, the motor influences on ridden horses and the indicators and the effects of stress in riding horses. A practical session is aimed to stress the strong link between ethology and equitation and a specific session is dedicated to identifying the immediate priorities of research.

Each of the papers in these proceedings has been subjected to two independent peer reviews, except for the abstracts of posters published in the session "not peer reviewed", which arrived after the deadline. This does not mean that we agree with all of the authors' opinions but that we commend the papers to you as a source of discussion. This event is a clear sign of the growing interest for horse behaviour. We believe that the interchange between the scientific and practical sectors is not only useful but necessary. It may facilitate and accelerate progress of this field and we sincerily hope that it will offer you an enjoyable experience.

Michela Minero and the Organizing Committee

ORAL PRESENTATIONS

Ethological challenges for the working horse and the limitations of ethological solutions in training

Paul McGreevy[1], Andrew. McLean[2]

[1] *Faculty of Veterinary Science (B19), University of Sydney, NSW 2006, Australia.*
[2] *Australian Equine Behaviour Centre, Clonbinane Road, Broadford, VIC 3658, Australia.*

While animal behaviourists generally are interested in learned behaviours, ethologists concentrate on adaptive behaviours. The terms *equine ethology* and *ethological training* are becoming commonplace in the equestrian domain, yet they seem to be used with a conspicuous lack of clarity or mention of learning theory. This paper summarises the ethological challenges encountered by working horses and considers the merits and limitations of ethological solutions. Ethological challenges include interventions that cause physical discomfort, social frustration or environmental distress. The most obvious sources of *physical* discomfort during work are the bit, the rider's leg/spur and the girth, while examples of *social* challenges may include leaving the social group, proximity to unknown or antagonistic conspecifics, walking abreast rather than trekking in a line, ignoring the behaviour of nearby horses and being restrained from displaying to other horses. Examples of *environmental* challenges include leaving the home range, deviating from an obvious or habitual track and traversing, rather than avoiding, obstacles, including ditches, vertical fences (especially when the landing side cannot be seen). Ethologically sound solutions include social facilitation that prompts, for example, one horse to follow another onto a float, massage that mimics allogrooming and pheromonatherapy. These are appealing modalities since they can offer the elusive "quick-fix" without the need for an ongoing retraining program. They do not depend on the horse 'wanting to be with' or 'wanting to please' the trainer. The distinction between so-called dominance styles and leadership is critical here. Any technique that involves the application and withdrawal of aversive stimuli cannot be considered outside the framework of learning theory. When ethological solutions are not available or appropriate, trainers are required to call on the appropriate and properly executed use of habituation, classical and operant conditioning and shaping programmes in training and possibly also psychopharmaceuticals to craft effective changes in behaviour.

An audit of the application of the principles of equitation science by qualified equestrian instructors in Australia

Amanda Warren-Smith[1,2], Paul McGreevy[2]

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[2] *Faculty of Veterinary Science, University of Sydney, NSW, 2006.*

Learning theory describes the ways in which animals learn. It establishes clear guidelines and training protocols for correct training practices and methods of behaviour modification. Horses, like all animals, learn most effectively when training methods are appropriate to their cognitive ability and ethology, as well as being based on a valid interpretation of learning theory. Inappropriate training practices can have a negative impact on the horse's welfare and can lead to conflict behaviours that jeopardise the safety of riders and handlers. Qualified equestrian coaches play a significant role in the dissemination of information on training practices as most participants in equestrian sports seek regular professional instruction. Therefore, to determine the level of learning theory knowledge among qualified equestrian coaches, a 20-question survey was distributed to all coaches registered with the National Coaches Accreditation Scheme in Australia (n=830). Data were sorted and coded, then put into 2-way pivot tables which were then tested for significant associations by chi-square analysis. Of the 206 respondents, most (79.5%) considered positive reinforcement to be *very useful* ($P<0.001$), yet only 2.8% correctly explained its use in horse training ($P<0.001$), while 19.3% considered negative reinforcement to be *very useful* ($P=0.011$) with only 11.9% correctly explaining its use ($P<0.001$). The results indicate that most equestrian coaches have, at best, a rudimentary knowledge of the principles that govern learning. This highlights the need for more appropriate education of coaches that aims to improve their understanding and application of training techniques for horses. Education of this sort has the potential to reduce behavioural conflict and ultimately improve the welfare of horses in training.

Training methods for modification of fear in horses

Janne Winther Christensen[1], M. Rundgren[2], K. Olsson[2]

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Horse riding ranks as one of the most dangerous sports in terms of the number and seriousness of accidents, and investigations have shown that unexpected flight reactions are a major cause of accidents. Development of appropriate training methods for reducing fearfulness in horses is therefore of practical importance. We used 27, 2-year-old, naïve Danish Warmblood stallions to study how horses learn to react calmly to an otherwise frightening stimulus. The horses were trained according to three different methods; in the first method (Habituation), the horses (n=9) were exposed to the full stimulus (a moving, white nylon bag, 1.2 x 0.75 m) during five daily exposures until they met a predefined habituation criterion. In the second method (Desensitization), the horses (n=9) were introduced gradually to the stimulus and were habituated to each step, before the full stimulus was applied. In the third method (Counter-conditioning), the horses (n=9) were trained to associate the stimulus with a positive reward, i.e. to feed next to it, before they were exposed to the full stimulus. Five training sessions of 3 minutes were allowed per horse per day. Heart rate and behavioural responses were registered and analysed in a One Way ANOVA. There was no significant difference between methods in behavioural or heart rate responses during the first training session. However, horses on the desensitization method showed fewer flight responses totally and needed fewer training sessions to learn to react calmly to test stimulus (Survival Analysis: U_2=9.16, P=0.01). Likewise, all horses on the desensitization method eventually habituated to the stimulus, whereas a few horses on the other treatments did not. We conclude that desensitization appears to be the most effective training method for horses in frightening situations and that the choice of training method is likely to be especially important for the more reactive horses.

Reducing wastage in the trained horse: Training principles that arise from learning theory

Andrew McLean[1], Paul McGreevy[2]

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[2] *Faculty of Veterinary Science (B19), University of Sydney, NSW 2006, Australia.*

Direct evidence suggests that the horse was domesticated at around the end of the 2nd millennium BC. Since that time the horse has been used as a vehicle of war, as a form of transport, as a draught animal in agriculture and, more recently, for leisure and sporting pursuits. Unsurprisingly, techniques from various methodologies for training horses have been developed and passed down the generations. By way of example, the first literary work on horse training was *Hippike*, a treatise written by Xenophon over two millennia ago. Because of the historical successes of these methodologies, it is likely that they embrace much of the horse's cognitive abilities, ethogram and learning modalities.

More recently, the publication of alarmingly high wastage rates in horses between the ages of 2 and 7 years have led to the suggestion that such wastage arises from inappropriate training and/or management. Therefore, there is good reason to doubt that extant training methodologies fully align with the horse's cognitive abilities, ethogram and learning modalities.

This theoretical paper examines aspects of equine cognition, learning theory and ethology as applied to horse training. Ten training principles have emerged that optimally account for the horse's ethological and learning abilities. These principles can be summarised as:

1. Use learning theory appropriately
2. Train easy-to-discriminate signals
3. Train and subsequently elicit responses singularly
4. Train only one response per signal
5. Train multiple signals per response consecutively
6. Train all responses to be initiated and subsequently completed within consistent time-frames
7. Train persistence of current operantly conditioned responses and test regularly
8. Avoid and disassociate flight responses as appropriate
9. Avoid punishment

It is proposed that adherence to these principles should result in reduced wastage of the trained horse and that these should be incorporated into all horse training methodologies.

A preliminary investigation into verbal cue-colour association learning in horses (*Equus Caballus*)

Elke Hartmann[1], Marthe Kiley-Worthington[2]

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[2] *Eco/Etho Research and Education Centre 'La Combe', Bezaudun sur Bine, 26460 Drome, France*

Studies investigating linguistic skills in apes, marine mammals, a grey parrot and, more recently, the domestic dog have indicated that these species can acquire certain aspects of human language; in particularly they can learn verbal cues ('words'). Relatively little scientific attention has been devoted to experimental research on equine cognition, although the possibility that horses could learn to comprehend at least some aspects of human language has considerable application for their welfare and use. The present study was designed to investigate learning of verbal cues and colour discrimination abilities in a group of 6 horses by using a co-operative teaching approach. The co-operative learning strategy was adapted from the work with human infants, in which words, gestures, and primary as well as secondary positive reinforcement were applied to facilitate learning. The horses had to learn the relationship between the name of a colour and the colour, by touching it from a board containing three and four coloured plastic cards. A blind experiment tested the subjects' ability of solving the discrimination problem by touching the named colour in visual absence of the experimenter. The results indicate that the horses were able to recognize the colours on verbal command. They responded above chance level (33,3%) to the colours and reached the learning criterion of 60% correct responses for two consecutive teaching sessions. The horses showed no significant decrease in performance when tested in absence of the experimenter (yellow: T=0.5, P=0.6, blue: T=2.4, P=0.1, green: T=1.1, P=0.3). It is concluded that a co-operative learning regime can be successful in facilitating learning of verbal cues and colour discrimination abilities in horses.

Horse whisperers and horse 'behaviourists': are we jeopardising our horses?

Hayley D. Randle

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There has been a dramatic increase in the employment of 'behavioural experts' to solve equine problems. UK 'behaviour experts' remain unregulated and the Veterinary Surgeon's Act (1966) requirement for 'prior consent to be gained from the veterinary surgeon for the paid treatment of the horse' is rarely met. A questionnaire comprising open and closed questions was distributed to 200 randomly selected British Riding Club members in order to investigate horse owners' understanding, and use, of Horse Whispers (HW) and Horse 'Behaviourists' (HB). Most of the 90 respondents (return rate=45%) considered themselves to possess either a medium (50%) or advanced (40%) level of horse-knowledge. (The remaining 8% were 'basic'.) Discourse Analysis of the descriptions given associated the terms 'communication' and 'natural' with HWs and the terms 'scientific', 'natural' and 'training' with HBs. 20% of owners had used a HW and 20% had used a HB (only one owner had used both). 'Basic' owners were more likely to believe in the advice provided by HWs and subsequently to employ them, than more knowledgeable owners (Chi^2_2, Yate's Correction=7.07, $p<0.05$ and Chi^2_2, Yate's Correction=8.08, $p<0.05$ respectively). Unsurprisingly, owners who thought that a HW would work would be more likely to use one (Chi^2_2, Yate's Correction=13.2, $p<0.0001$). Conversely, opinion of and likelihood of using a HB was not affected by knowledge level (Chi^2_2 and Chi^2_2 =4.37 respectively, both $p>0.05$). Further analysis indicated that basic owners were also more likely than more knowledgeable owners to use a HW, but not a HB, as a 'last resort'. Horse owners clearly appreciated that HBs probably possess a greater scientific underpinning than HWs. Since less knowledgeable owners were the most likely to expose their horse/s to the work of HWs, both initially and as a last resort, it can be concluded that the welfare of some horses is being jeopardised.

Does punishment work? Rider responses and behaviour problems in ridden horses

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Horses are traditionally trained using negative reinforcement to prompt movement, with positive reinforcement used to reward desired responses and punishment used to discourage undesired responses. However, riding instructors rarely highlight the importance of continuity, contiguity or schedules of reinforcement and riders may fail to apply principles of learning adequately. The resulting frustration may lead to harsh application of rider aids, leading to poor physical and psychological welfare in ridden horses. These may lead to behaviour problems as horses attempt to cope with the confusion and abuse. We tested the relationship between behavioural problems in horses whilst ridden and rider tendency to use positive reinforcement of desired behaviour and punishment of undesired behaviour. Using self-report via an Internet survey, we asked riders to describe their response last time their horse displayed behaviour described in eight common riding scenarios: four where the horse made efforts to respond to accepted norms of behaviour, and four where the horse responded inappropriately. Rider responses across the four scenarios were coded into an overall score of probability of responding with punishment through neutral to positive reinforcement. An index of ridden behaviour problems was made from the sum of self-reported frequency of common behaviour problems in the last week that the horse was ridden. There were fewer ridden behaviour problems in horses with riders who described a higher probability of using positive reinforcement of desired behaviour (Spearman's r=-0.232, N=93, P=0.026), but there was no correlation with probability of using punishment for undesired behaviour. The effect was not explained by overall consistency of riders reinforcing desired behaviour and punishing undesired behaviour, but there was an effect of overall probability of using positive reinforcement (even of undesired behaviour) (Spearman's r=-0.211, N=103, P=0.033). These data suggest positive reinforcement is a more effective method of training horses than punishment.

Assessment of the behaviour and haltering work time in young unhandled horses: influence of three different training methods

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Three different training methods were used to halter 12 unhandled horses. Some behaviours and work times were assessed. 8 Italian draught horse and 4 mustangs were used and divided in 3 groups: **A**(4), **B**(4) and **C**(4). **A** followed a negative reinforcement protocol (Monty Roberts' method): horses were left free to choose between approaching the trainer to avoid the negative stimuli (cantering far from the trainer) and stepping back from him. **B** followed a mix of coercion and positive reinforcement method (traditional): horses were forced to accept the trainer's requests and then rewarded with food; any attempt to escape was hampered. **C** followed a negative reinforcement protocol (Jeffery's method): horses were on the rope and whenever they would come closer to the trainer, the rope wasn't pulled anymore, and attempts to escape were partially hampered. Two trainers were employed for each method to minimize individual influences. Total work time (hours) to halter the horses was assessed, as well as some behaviours observed during this work: escape (or attempt) from the trainer's request, attention, investigation, defecation and aggressive behaviours towards the trainer. Behaviours of **A** and **B** were recorded on the field, while for **C** video analysis was used (Observer®). Two experienced individuals proceeded with the observations. Mann-Whitney test ($P<0.06$) was used to analyse behaviours, while variance analysis ($P<0.05$) was used for the work times. Results show as letting the horses more possibilities of choice (A *vs*. B and partially C *vs*. B) haltering time, investigation and attention activities statistically increase, while aggressive behaviours towards the trainer and escape statistically decrease. Those preliminary data indicate a sign of a greater willingness to investigate and pay attention by the horses of A and, in part, of C. Moreover, work with group A would have to be less dangerous for the trainer.

HorseConnexion: improving horse welfare through knowledge transfer to riders, riding teachers and horse owners

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More and more people are involved in horse-related activities. The horse is an important leisure, sport and companion animal and the equine sector is growing all over Europe. The consequence of this development is that many horses are used by people with no former equine education or experience at all. This is a serious risk for the welfare of the horses involved. It is therefore very relevant to further educate people in areas such as behaviour, nutrition and training of horses. Equine scientists can play an important role by transferring the results of their studies more effectively to this target group. At international meetings, such as the Equine Behaviour Workshop at the 37th Congress of ISAE (2003) or the Equine Group Meeting at recent meetings of the EAAP, it has been highlighted that ordinary horse owner/riders, even those working in the equine industry, can find it very difficult to access and apply knowledge arising from equine research. The gap between scientists and practical horse people makes it difficult for research results to be put into practice.

To solve this problem and to contribute to improving the welfare of horses, the international website HorseConnexion (www.horseconnexion.org) has been set up. HorseConnexion translates scientific knowledge into easily accessible information that can be applied by riders, riding teachers and horse owners to improve the management, training and use of horses in their care. HorseConnexion is produced in English, Swedish and Dutch, and provides a platform for horse scientists all over the world to disseminate their results to a wider public.

Do horses exhibit motor bias when their balance is tested?

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Riding requires horses to be equally balanced to the left and right in an arena, therefore training and riding is carried out equally in both directions. It is a common perception that horses exhibit motor bias despite these efforts to make them ambidextrous. How this bias, if it indeed exists at all, is affected by training remains unclear. This study aimed to investigate motor bias and the effect of training by testing an unridden group (n = 15) and a ridden group (n = 15), using 3 indicators where balance was challenged. Indicators were measured as horses were asked to canter on the lunge (n =10) each to the left and right - time spent in canter (seconds), proportion of time on the correct lead, and proportion of time spent disunited. A grazing stance test where left and right preference in foreleg advancement was also measured (30 consecutive advancements).

Pearson's regression analysis was used to compare responses between acitivities where balance was not actively challenged (grazing), to when balance was actively challenged (lunging). An ANOVA was used to compare responses to the left and right in the 3 lunging indicators, both within and between the two groups.

No bias was found in either group when balance was challenged (all $p > 0.05$). Whilst this result supports the hypothesis that ridden horses are unbiased, it cannot be concluded that ambidextrous training was an influence, as no bias in unridden horses was found. Estimation of motor bias in horses may be affected by indicators used to measure bias, an idea supported by the absence of correlation between grazing stance and lunging indicators (all $p > 0.05$). If ridden horses are unbiased, strong human motor bias might underlie the common perception that they are biased. The nature of perceived bias during riding requires further research.

Visuomotor influences on jump stride kinematics in showjumping horses

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Showjumping is a popular equestrian activity demanding precise and accurate stride kinematics. Idiosyncrasies of the equine visuomotor system may influence jump stride kinematics (JSK) during these tests of equine athletic ability. We investigated the effects of different ocular and motor directional treatments on JSK in 12 showjumping horses (Geldings=6, Mares=6). The horses wore a modified visor to control for (1) binocular, (2) right monocular or (3) left monocular vision. The horses undertook three jumping efforts (loose jumping without a rider) of an experimental fence under each ocular treatment, initially travelling in a counter-clockwise and subsequently clockwise direction; such that total jumping efforts numbered 18 per horse. Sagittal plane S-VHS recordings showed an overall tendency for male horses to perform slightly bigger jump strides in both the vertical ($P = 0.061$) and horizontal plane ($P = 0.057$). Within the female group, there were no differences in JSK under any of the directional or ocular treatments. However depth perception may have been compromised in male horses during some trials. When confined to right monocular vision during clockwise trials, male horses 'missed' (inacurate stride kinematics) and leading forelimb placements were significantly closer (mean distances) to the fence (649 mm) compared to their binocular (677 mm) or left monocular (691 mm) treatments ($P < 0.05$). The leading hind limb placements at the point of take-off on approach to the fence were also significantly closer (502 mm) compared to 583 and 596 mm during the same trials ($P < 0.05$). The findings may indicate discrete differences in depth perception ability, visual processing and brain organisation between male and female horses. Different sex specific training routines may be an important consideration for training showjumping horses for optimal learning. Further work is warranted to clarify the linkages between motor behaviour and the visual system in the horse.

Assessment of ethological methods as a diagnostic tool to determine early overtraining in horses

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Overtraining of equine athletes is a serious problem for both equine and human athletes. In human athletes, early overtraining can only be predicted reliably by means of questionnaires (Profile-of-Mood-State). An ethological translation of the questionnaire was made for horses. Twelve Standardbred geldings (age 1.5yr) were selected for a longitudinal study of experimentally induced overtraining according to a previous described systematic standardised protocol characterized by insufficient rest days. Training was divided into: 18 weeks with endurance and intensity exercise (phase 2), 6 weeks intensified training (phase 3), and 4 weeks of detraining (phase 4). During phase 3 the control horses (CH) exercised 4 days/week, whereas the overtrained horses (OH) exercised 6-7 days/week. At the end of each phase, a standardised exercise test (SET) was performed. During the phases 2-4, three types of standardized ethological observations were performed systematically: (I) observations during training, (II) 6-hour time budget observations in home stable, (III) Novel-Horse-Test to detect possible behavioural changes in a potentially challenging situation (5 minutes of "free" interaction with a novel gelding according to a strict 15 minute protocol). Observations I&II were performed with simultaneous heart-rate-variability (HRV) measurements, as well as other physiological measures. HRV is possibly an interesting stress parameter. Preliminary data were obtained from ten horses. Two OH indeed showed decreased performance in the 3rdSET. Most OH showed weight-loss compared with controls during phase 3. Several behaviour parameters discriminated between both groups: in the OH anticipation on presence of 'Novel Horse' decreased, contact duration with the Novel Horse decreased, time spent to eat per kg food decreased and % time 'stand alert' increased compared to CH. Changes in HRV parameters showed, in general, less variation in the OH compared to CH in phase 3. Standardised structural behavioural testing seems a promising additional tool for diagnosing overtraining when taking certain pre-limiting conditions into account.

An approach to stress induced by rider in show jumper horses

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A jumping competition entails a rhythmic result where the approach by the horse and the rider to a fence is influenced by how the previous jump was negotiated, the horse conformation, and the rider experience. The degree of stress for the horse is also influenced by the rider ability to interpret the competition in relation to the horse potential. The present study was undertaken to assess the influence of different characteristics of riders on heart rate, metabolic parameters and stress indicators in show jumping horses. Two pairs of riders (A-B and C-D, each pair with one more demanding rider) were coupled to two pairs of horses (F-G and H-I). A and B, riding F and G respectively, performed in an indoor arena a 15 min test: consisting of a warm-up phase followed by a series of jumps over a pair of vertical fences. For H and I, ridden by C and D in an outdoor arena, the test consisted of a 15 min warm-up, a series of jumps over a vertical fence, and then of an exercise including vertical and oxer fences. A week later the same exercises were performed changing the combination rider-horse within each pair of horse and rider. The tests were video-recorded and heart rate was measured continuously. Blood samples were collected at rest (AR) and immediately after the test (AE) to measure GSH-Px, SOD, AOP, glucose, AST, LDH. Cortisol was measured in blood and saliva samples collected at the same time (AR and AE). The data were subjected to ANOA according to work, rider and work rider interaction factors. Heart rate and stress parameters values consistently increased during jumping phase and when the horses were mounted by the more demanding rider. There was a significant correlation between blood and salivary cortisol.

Stronger fear reactions in Dressage versus Showjumping horses may be linked to genetics but not training

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In Europe, it is a common belief amongst riders that Dressage horses are more easily scared than Showjumping horses. It is not clear whether these differences, if they exist, are due to differences in training, genetics, or preferences of the riders for certain characteristics in the horse that go along with its reactivity. The following study was designed to detect differences between untrained (U) and well-trained (T) horses of both Dressage (D) and Showjumping (J) lines with regard to intensity of reaction and ease of habituation to a frightening stimulus. A horse was considered to belong to one genetic line (D or J) if it had a sire with an estimated breeding value in its discipline of greater than 110 index points and no more than 110 points in the respective other discipline. In addition, horses had to be trained solely in their respective discipline. Forty-three horses were led individually into a familiar indoor arena, allowed to feed oats from a bucket on the floor, and exposed in five consecutive trials to a standardized fear-eliciting visual and auditory stimulus, consisting of a moving plastic bag. Intensity of reaction, as measured on a scale from 1 (none) to 5 (flight), time to calm down (defined as recommencing chewing), and time to resume feeding were recorded for each trial. Discriminant analysis was used to verify the classification of horses of unknown discipline into the groups D and J based on their sires' breeding values. Repeated measures analysis showed that TJ took longer to calm down than TD ($P<0.05$), while there were no significant differences ($P>0.1$) for time to resume feeding. However, D reacted stronger ($P<0.05$), than J regardless of training status (U or T), indicating that there may be a genetic basis for stronger, though short-lived fear reactions in dressage horses.

Behaviour of horses during habituation to a novel object

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A horse's first reaction, being a 'flight' animal, to an unknown novel object (NO) or situation is typically characterized by expression of avoidance behaviour. The strength and persistence of fearful behaviour are essential for security of both the horse and humans during riding and daily care. Repeated exposition to a novel situation usually decreases the flight reactions of horses due to habituation. However, it is known that some horses would shy continually in the same situation or when exposed to some objects. The aim of the study was to investigate (1) fear/startle and (2) exploratory reactions of horses to NO presentation during successive days of exposition. Ten horses of Konik polski breed (3 mares, 2 stallions and 5 geldings) were used in the study. The horses were 2-3 years old. The experimental procedure consisted of 5-minutes of exposition of horses to an NO (open umbrella) repeatedly for 9 successive days. The behaviour of the horses was video recorded and data analysed statistically using Friedman test. The results showed that there were individual differences in the strategies for coping with unknown situations, some horses presented an active approach by exploration, others exhibited avoidance behaviour. The consecutive day of the test had an effect on the percent of time standing still ($P<0.0001$), trotting ($P<0.0001$), cantering ($P=0.0091$) and exploring other objects than NO ($P=0.0004$). Neither startle response of the horses towards NO nor percent of time spending on approaching NO were affected by day of the test. During successive 9 days of the study the reactivity of horses as expressed by locomotor activity decreased, however the startle response did not. It may be concluded that observed horses did not habituate to a NO presentation in terms of startle reaction, but exhibited a decrease in escape behaviour as a consequence of habituation.

POSTERS

Dancing with horse whisperers: What horse(wo)men want

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In western cultures in which equestrian sports are practiced, four times as many females as males participate in leisure horse activities. In addition, recent research indicates a change in the way in which horses are viewed by their mainly female owners, who now regard their horses as family members and life partners. Women in particular seek relationships with their horses based on friendship, trust and mutual cooperation. This shift has been recognized by the natural horsemanship industry which offers explanations of horse behaviour in lay language combined with a marketing style that is especially attractive to many horsewomen. The author concludes that despite the use of terminology that is often scientifically incorrect or inappropriate, the philosophical intentions of both traditional and new-wave horsemanship are in accord in their advocacy of non-violent training and positive outcomes for horses and riders. These observations have implications for equine scientists attempting to disseminate the results of their research to a wider equestrian community. By identifying and understanding their target audience and by adopting more modern and sophisticated marketing strategies to reach this audience, it might be possible to narrow, if not "bridge the gap between academia and practice."

Roll and Rise: A Sign of Comfort in Horses?

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Before a horse stands up after a period of recumbency, it sometimes performs a rolling behavior during which it goes from sternal to lateral recumbency, rolls over on its back, down again and then gets up. When housed individually in a box, the horse can sometimes be seen wiggling around while laying on its back, possibly to move away from the box wall. When kept on pasture, the rolling behavior is more varied. Thus, most horses roll over on their back (90 degrees) and back again before getting up. Some horses change from sternal to lateral recumbency and back to sternal recumbency before getting up (”rolling” 0 degrees). A few horses have been seen rolling180 degrees, occasionally repeatedly, but they always roll back to the original side, before getting up. On pasture, no horse has been observed wiggling around while on its back. Similarly, the behavior has nothing to do with grooming behavior, because no ”scratching” of head, neck, or back has ever been observed.

So far, not all horses have been seen performing the rolling behavior, only up to two thirds of observed horses. Similarly, they do not perform the behavior every time they get up, only one third of the times. If a recumbent horse is disturbed (e.g. by another horse), it gets up without performing the rolling behavior. Despite the frequent performance of the behavior, it has hardly been described before, let alone studied. Consequently, nothing is known about its function. One possibility is that it enables the horse to move away from box walls to get enough space for the rising behavior. Another possibility is that it is a kind of comfort behavior, something similar to stretching before getting up. More observations of the behavior are neccessary before its function(s) can be explained.

A preliminary 2-foal study on the use of positive reinforcement from birth

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Horses are born precocial. They are pre-programmed by nature to learn many things immediately for survival. We wanted obedient foals that were reasonably safe to handle. We documented, using video recording, how quickly our foals could learn a variety of behaviors using a marker sound that was consistently followed by positive reinforcement. We used a tongue click as a behavior marker. A verbal bridging signal was variably used. Initially a friendly scratch or rub was the reinforcer. Both foals began to accept sweet feed as a reinforcer by day 10. Physical and verbal cues signaled for a behavior. No control group was used. One foal was targeting by day 6 and being bathed without restraint at day 9. At 2 months old, both accepted handling of all body parts, wore a halter, surcingle and butt strap, gave to pressure, trailered, and targeted objects. At 4 months old both stood tied, lounged, and ground drove. By one year of age on cue behaviors for both foals included picking up objects, coming when called, urinating, drinking, sitting on a beanbag, side passing, backing, executing forehand and haunch turns, putting their head down, wearing a saddle, breast collar and crupper, and Spanish walking. One also jumps objects, lies down, and squares up; the other straddle walks logs, teeter totters on a board, and puts her eye and ear in our hand on cue. We have found no negative outcomes with these foals using this method when working within the newborn or juvenile horses natural physical capabilities based on age. They have become reasonably safe to handle, and can be cued to execute a variety of behaviors.

General and individual biomechanics/energetics of locomotion in performing quadrupeds

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Horses (*Equus Caballus*) and camels (*Camelus Dromedarius*), are well known for their power and economy. Both species show low metabolic cost of transport, on a mass specific basis, with gaits relying on mechanical paradigms similar to the ones for bipeds. Motion analysis of walk, trot and canter/gallop revealed that horses use inverted-pendulum at low speeds, pogo-stick elasticity at intermediate ones and both energy-saving strategies at high speeds (Minetti et al 1999). This has been inferred from the mechanical energies (potential and kinetic) of their body centre of mass (BCOM) and by relating the total mechanical work to the measured metabolic consumption. It emerged that bouncing gaits (trot and canter/gallop) heavily rely on storage and release of mechanical energy within the elastic structures of the body. Camels, particularly, consume about 40-50% less energy than a (similar sized) horse moving at the same speed (Saltin et al 1994). A recent technique describes the individual 3D path of the BCOM while moving on a treadmill. This generates a closed loop (Lissajous contour) along which BCOM travels during the stride. Preliminary application of this methodology showed differences (3D shape and symmetry) in walking pattern between young and adult humans, helping to understand the higher metabolic cost in the elderly. The 3D contours of horse locomotion is here presented, and the resemblance to bipeds gaits is evident. This method could be used to compare the mechanics of locomotion of horses and camels in the attempt to understand the astonishing economy of the latter. Also, this method could be helpful to study locomotion anomalies, detected along in the stride 3D path, and in the follow-up of rehabilitation therapies.

Responses of school horses to a flat lesson

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It is often assumed that riding school horses are not adverse to having different riders and being ridden several times each day. The aim of this study was to determine if the welfare of riding school horses is adversely affected by this scenario. Four horses, each ridden by four different riders, were studied during a 45 minutes flat lesson. Basal, as well as pre and post lesson salivary cortisol levels were measured. Behaviour was analysed for the duration of the lesson and a personality assessment of each horse was undertaken. There was no significant effect of the lessons on salivary cortisol levels, when blocked for horse ($F_{1, 27}$ = 0.4 P = 0.5). The behaviour of the horses was consistent, with tail flicks being the only behaviour that varied significantly. Tail flicks occurred more often during walk and canter gaits although this was not significant, and were not influenced by rider ($F_{3.676, 11.028}$ = 7.0 P = 0.8). There were however consistent differences between horses in tail flick frequency during different gaits (Gait * horse $F_{3.313, 9.939}$ = 4.6 P = 0.06). In all gaits the horses spent at least 60% of the time with their heads elevated. The results from this study suggest that cortisol is not sensitive enough to be used to differentiate between different training methods. In addition although differences in behaviour were observed they were very subtle, therefore very detailed observation and analysis of horse behaviour would be required to differentiate between training methods. In conclusion, with regard to riding school horses, there does not appear to be a serious welfare concern during traditional flat lessons. Future trials will investigate the effects of using a positive re-inforcement training regime.

Circulating β-endorphin levels of trained Standardbred racehorses after competitive and not competitive races

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The plasma β-endorphin responses to competitive and not competitive races have been studied on 10 healthy Standardbred racehorses (n=7 males and n=3 females), 2 years old (n=4) and >3 years old (n=6). All horses were already accustomed to be trained for competition and were submitted to two different exercise conditions on a 1600 m grass track: not competitive (Race 1) and, after 3 days, competitive (Race 2) race. Blood samples were collected from jugular vein prior to exercise and 5 and 30 minutes post-exercise. To determine the effect of exercise an analysis of variance for repeated measures was applied. To compare post-exercise with basal values a paired t-test was applied. The comparison between groups was done with unpaired t-test. Data obtained showed a significant increase of plasma β-endorphin levels at 5 min ($p<0.001$) after Race 1 as compared to basal values. After Race 2, plasma β-endorphin levels were significantly increased at 5 ($p<0.001$) and 30 min ($p<0.01$) as compared to basal values. The β-endorphin levels were significantly higher at 5 min ($p<0.001$) and 30 min ($p<0.001$) after Race 2 than after Race 1. Exercise effects on circulating β-endorphin changes were shown both after Race 1 ($F=6.36$; $p<0.01$) and Race 2 ($F=41.74$; $p<0.01$). No significant differences of β-endorphin levels in both races between 2 years old and older horses and between male and female horses were found. The results of present study showed that both races induced the opioid peptide response at 5 and 30 minutes, but higher increases were recorded after competitive race as compared to not competitive race. In fact, the significantly highest hormone levels recorded once the horses were submitted to competition could be an effect of the high intensity of exercise condition and a consequence of competition stimuli, attributable to the greatest emotional impact.

EuroRide – an international education for riding instructors

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Obviously, riding techniques and training methods of young horses are relevant to the welfare of horses. Although all rooted in classical riding theory, clear differences in methods and techniques can be observed between countries. EuroRide is an international course for riding instructors (international Level 2 or higher) where participants get the opportunity to experience different national styles of riding, horsemanship and training of young horses and to reflect on the advantages and disadvantages. Since the riding sport gets more and more international and EuroRide provides the participants with international experience and knowledge they gain a clear advantage on the international job market. EuroRide is a cooperation between Ridskolan Strömsholm in Sweden, Ecole Nationale d´Equitation in Saumur, France, Deutsche Reitschule in Warendorf, Germany and Helicon NHB Deurne in the Netherlands. The duration of the course is altogether ten months and the students start with three months in Saumur. Then smaller groups of students go to Sweden, Germany and the Netherlands. Some periods the students are on the different schools while in other periods they are on placements. The second group of six students finished EuroRide in June 2006 and they organised a closing seminar in Strömsholm, Sweden. At the seminar, the students reported on the experiences they gained about the different aspects of riding, training and teaching in the different countries. The students were in general very pleased with the course and with the experiences at the different schools and placements. They all agreed that this international experience made them more open to different approaches and put their work and skills in a much broader perspective. We trust that the course contributes to a successful future international career.

A Pilot Study: Can owners predict their horses' behaviour?

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Recent research has started to focus on defining and measuring temperament traits in horses. Experience and interpretation of a horses' temperament influence how we handle the animal in a given situation and this may have implications for welfare. The aim of this study was to establish how accurately owners could predict their horses' reaction during a novel object test. A novel object test was set up with 10 horses of mixed breed (11.5 ±7.3 years), stabled in the same yard for at least one year. The test comprised of throwing an orange beach ball (50 cm diameter) into a small indoor school. The horses were released into this area and the ball was thrown when the horse occupied the far section of the school in a quiet manner. Prior to this test, owners were asked to first describe generally how their horses would react to the challenge (Q1) and then to pick pre-described options on more detailed questions (Q2). An ethogram was set up to record actual behaviour and the chi-square test was used to test for differences between owner predictions and actual behaviour of horses. A total of 16 different behaviours were recorded, 12 of which were predicted to occur by owners in Q1 (χ^2 = 4.7, $p<0.05$). When matching individual horse predictions for Q1, 63 % of the behaviours were correctly predicted (χ^2 = 2.7, $p=0.09$), showing a very slight trend. Continuous cantering around the object (occurrence = 5) but also sniffing the object (occurrence = 7) were not predicted by most owners. For Q2 only 52% of predictions matched actual behaviour (χ^2 = 0.21, $p=0.65$). Behaviours which were not predicted at all in Q2 included kicking at object with hindlegs (occurrence = 1), trotting to exit (occurrence = 4) and canter around the object (occurrence = 5). Although most 'behaviours' shown were expected by horse owners, the order and intensity of occurrence could not be predicted.

NOT PEER REVIEWED

Safety compliances in equestrian centers

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The application of D.Lgs 626/94 referred to safety and health preservation in working places, is a very important subject nowadays. Yet, this application in horse centers is a real - problem and is often not properly applied.

With regard to this, we have clarified the roles and duties that employers must respect when there is even only one partner whatever his role may be (he may be familiar, casual, dependent, or another kind of partner).

We have done a risk evaluation taking into consideration the task-working risks within the stables, identifying necessary individual protection devices and giving some operative information.

We - believe that such a process can a- lead to a reduction of accidents and occupational injuries, by greatly offsetting the efforts, thus creating conditions for a - safer working life.

Training, competition and transport in horses: influence on physiological and biochemical parameters

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Considering the stressful impact on horses of starting a training period, performing competitions at high level and being transported for several hours, we wanted to verify the effects of such events on physiological and biochemical parameters. Three horses, two males and one female, started being trained just one month before a national driving competition consisting of dressage, marathon and obstacles. Blood samples were collected in the first week of training, after 20 days of daily hard work, at the end of the competition and when returned home after a long journey. Samples were repeated after 2 days, one and two weeks after the arrival to verify the recovering faculties over this period.

Blood and serum samples were used to evaluate the following: hemocromocytometric parameters, lysozyme and bactericidy, total protein and electrophoresis, aspartate aminotransferase, alanine aminotransferase, glucose, blood urea nitrogen, creatinine, creatine phosphokinase, and lactate dehydrogenase.

During this intense period of activity the horses physiological parameters showed significant differences in lysozyme, glucose, creatinine, creatine phosphokinase, lactate dehydrogenase and platelets. In particular some parameters indicate that in this case the competition is the most stressful event for the horses and that recovery takes place during the journey. In fact, after the three-day event, aspartate aminotransferase, creatinine, creatine phosphokinase, lactate dehydrogenase and platelets increased and the glucose decreased. Other parameters presented alterations at a later time, after transport: This is the case of lysozyme that decreased after the arrival home and haematocrit which, on the contrary, increased.

The use of an experienced horse in breaking of an untrained subject: preliminary observations

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A large amount of research has been done to investigate horse breaking and training procedures. However, there are no studies about the use of an old and experienced horse (traditionally called marrone in Italy), at the beginning of training. This method was commonly used in Argentina and Maremma (Italy) for the breaking of extensively kept horses. This traditional method was used in order to calm the young horse and assure the safety of the trainer. The aim of this research was to assess the behaviour of two horses (an older and experienced horse and a young untrained one) in order to evaluate the effect of this relationship.

The behaviour of a 22 year old horse and of a 4 year old subject was videotaped and observed continuously during a session of training. This session was divided into four steps: the two horses entering the round pen; observations of the body signals between the two horses; the reaction of the young horse when ridden by the trainer for the first time; the separation of the young horse from the experienced horse. The preliminary observations show an intraspecific communication through visual signals between the two animals which could positively affect the behaviour of the young animal during training.

Head lowering in horses

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Anecdotally, head lowering in horses has been proposed an indicator of calmness or submission. To investigate the effects of head lowering, the current study used four groups of horses. Groups 1 and 2 were held still while their pre-test heart rates were recorded. Then Group 1 was simply held without the application of head lowering while Group 2 had repeated stimuli for head lowering applied as required for a five minute period. Groups 3 and 4 also had their pre-test heart rates recorded but were then subjected to artificial arousal until their heart rates exceeded 100 bpm. Immediately after this arousal group 3 had no head lowering applied while Group 4 had the stimulus for head lowering applied for a five minute period. Heart rates were recorded continuously during testing and all behavioural responses were recorded on video for subsequent analysis. Repeated measures analysis showed that heart rate was not different between Groups 1 and 2 ($P=0.538$) or Groups 3 and 4 ($P=0.709$) for any of these time periods. The horses in Group 1 were most likely to exhibit licking and chewing ($P=0.017$). There were no differences between Groups 3 and 4 in licking and chewing ($P=0.439$). In Groups 2 and 4, significantly more stimuli were required to maintain the horses' heads in the lowered position during the first 30 s compared with any other periods measured ($P=0.012$ and $P<0.001$, respectively). These results indicate that head lowering did not influence the heart rate of the horses whether aroused or not and that the responses of licking and chewing were not associated with head lowering.

The timing of reinforcement when training foals (*Equus caballus*)

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Leading horses depends on the principle of negative reinforcement. To determine the optimal timing of reinforcement applied during the training of foals, 16 unweaned naïve foals that had previously undergone minimal human-animal interaction (i.e. not had a headcollar previously applied) were randomly assigned to three treatment groups for testing on ten training days at 14-day intervals. The training goal was to lead the foals a distance of 8 m by applying pressure to a headcollar via a lead rope. Three different latencies of negative reinforcement were evaluated by releasing the pressure either immediately as the first foreleg step commenced (Treatment 1); when the second step of the forelegs was completed (Treatment 2) or when the fourth step of the forelegs was completed (Treatment 3). Each foal's rate of learning was measured by the proportion of correct responses relative to the total number of responses performed. Behavioural responses and the steps taken over the distance were also recorded. Initially the foals undergoing Treatment 1 appeared to learn more quickly, suggesting that Treatment 1 was associated with the greatest compliance and the quickest learning. However, the foals undergoing Treatment 3 ultimately achieved significantly ($P<0.001$) more correct responses, suggesting that the longer delay of reinforcement (i.e., the longer duration of pressure) may enhance learning. All groups showed conflict behaviours, especially on the second day of training. This was reflected in the analysis of composite behaviours, with training days 1 and 2 being different ($P<0.001$) from training day 3 which were all different from training days 4 – 10 ($P<0.001$). These changes indicate that learning occurred in all treatment groups and that, as far as these three techniques are concerned, consistency of the training technique applied can have more profound effects on learning than the specifics of each technique.

Rein contact between horse and handler

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Direct observation suggests that riders often maintain excessively strong tension on the reins of a horse's bridle when riding. To investigate the range of rein tensions required to conduct a variety of horses through some basic movements, 22 horses of mixed age, sex, breed and training history were long-reined and ridden through a standard course. These movements were categorised into 'left turn', 'right turn', 'going straight' and 'halt'. The reins on the bridles contained embedded load cells (Rein Check™) that measured and logged the rein tensions used to elicit specific movements. The data were analysed using two-sample non-parametric Kolmogorov-Smirnoff tests. Long-reining required greater tensions than riding (10.7 ± 1.0 N and 7.4 ± 0.7 N, respectively, $P=0.025$), irrespective of whether the test was completed at a walk or a trot. When the horses were being driven or ridden in a straight line, the rein tensions did not differ between left and right ($P>0.05$), showing that the rein contact used was even. The rein tension required for going straight was less than for any other responses, showing that a lighter contact on the reins can be maintained between the application of specific stimuli. The halt response required the greatest tensions ($P<0.001$). Tensions required to complete the course did not differ with the use of a bridle versus a halter ($P>0.05$). A range of tensions required for horses to elicit specific movements emerged but the tensions recorded in this trial were strikingly less than others previously recorded. In the interests of horse welfare and effective training regimes, a concerted effort to reduce the rein tensions should be made. Having an objective measure such as rein tension will facilitate this process.

Use of positive and negative reinforcement in equitation

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Negative reinforcement currently underpins all equestrian training. To determine the feasibility of the use of positive reinforcement (PR) in equitation training, 20 horses were paired for age, sex and breed and placed into one of two groups. Group 1 (control) were reinforced using only negative reinforcement (NR) while those in Group 2 (treatment) were reinforced with both PR and NR concurrently. All horses were driven in long reins for 5 consecutive days and were shaped for the halt response. Attached to the lungeing roller was a remote-controlled device designed to deliver a liquid food reward (10% molasses water). All horses wore the same device although it was activated only for those being reinforced with PR. On day 1 of testing, a baseline test was conducted. This involved the horses being driven in long-reins while 20 random halts were elicited. The next 3 days of testing involved the horses being shaped for the halt response and being reinforced according to which of the two groups they belonged. The final day of testing involved repetition of the baseline test. Heart rates were recorded continuously as were behavioural responses and accuracy of completion of the halt response. Analysis of covariance showed no effect on latency to halt (P=0.851). Horses reinforced with both NR and PR nodded their heads less (P=0.021) and were more likely (P=0.012) to lick their lips than those reinforced with NR only. There was also a trend for an increase in roundness of outline of the horses reinforced with both PR and NR. These results suggest that the implementation of some PR into equitation training may be worth pursuing and PR may enhance the welfare of horses in training.

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