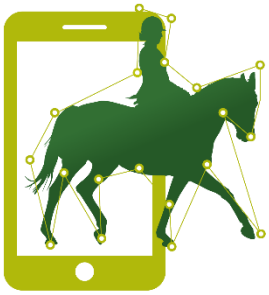
International Society for Equitation Science

Presents

17th International Equitation Science Conference

20th – 22nd October 2021 [BST]



INTERNATIONAL SOCIETY
FOR EQUITATION SCIENCE
ONLINE CONFERENCE 2021
ADVANCING >>> EQUESTRIAN PRACTICE

Advancing Equestrian Practice to improve Equine Quality of Life

Proceedings edited by

Dr Hayley Randle, Prof. Natalie Waran, Dr Jane Williams and Ella Bradshaw

Design

H. Randle, Charles Sturt University, Australia

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CONTENTS

INTERNATIONAL SOCIETY FOR EQUITATION SCIENCE
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LOCAL ORGANISING COMMITTEE WELCOME

Welcome to the International Society of Equitation Science and our 17th International conference. This online event will take place across three days and we are delighted that due to the generous support of our sponsors, we have been able to bring this to you free of charge.

The theme of the conference 'Advancing equestrian practice to improve equine quality of life' is one that should resonate with all who breed, produce, train and ride horses for pleasure or sport. Ensuring that we know what a good quality of life is for a horse, and that we have the knowledge and tools to be able to assess quality of life, is a central objective for much of the work that will be presented over the three days of the conference. The conference subthemes have been chosen because they elegantly illustrate how an evidence-based approach needs to be applied in practice to improve horse performance, rider experience and safety and most importantly equine welfare. In addition, the importance of effective communication to enhance the impact of research, and the use of effective educational approaches for supporting human behaviour change will be explored.

The conference begins with the Clever Hans Lecture, which will be given this year by Professor Mike Mendl from Bristol University, UK. He will discuss the latest research related to animal emotion and decision making and will provide the ISES conference audience with an opportunity to consider how we recognise, assess and provide for equine emotions when interacting with horses. We are most grateful to Mike for his valuable contribution to our field. Following on will be plenaries, keynotes and research papers as well as lightning talks and a panel discussion. Over the course of the three days of the conference we will get the chance to hear recorded or live talks from 68 excellent speakers. We have enjoyed working with all of those who have offered papers and posters and have been really impressed by not just the quantity of papers being offered, but also the quality. Although there is no doubt that COVID-19 has impacted on research and researchers, it seems that equitation scientists have been determined to get up to speed as soon as they have been able to, and it is great to see such enthusiasm and commitment.

We would like to thank all who submitted their work to be presented at the conference, its always difficult to select the papers for each session based on an abstract, but we hope that the authors and audience are satisfied with the programme. We would like to thank the wonderful conference sponsors, without whom we wouldn't have been able to make the conference so accessible to all, and to the ISES media members of the Council who as volunteers have given of their time and expertise to publicise this event. We would also like to thank Craig Hellen and the Bexmedia team for working with us (so patiently) to ensure that we have everything in place to deliver the conference online.

Finally, we would like to thank all of you – for joining this 2021 ISES conference, to make this one of the largest audiences that any ISES conference (so far!) has reached. We hope that if this is your first time, you are inspired to join ISES and help disseminate this evidence-based information far and wide, and if you are already a member of ISES then it is great to have you with us again.

Until we see you all again in the flesh – keep well and be safe.

Your local conference organising committee

Nat Waran, Jane Williams and Hayley Randle

International Society for Equitation Science
www.equitationscience.com

PRESIDENT'S WELCOME TO ISES 2021

I am delighted to welcome you to this conference, taking place as we begin to exit from almost two years of Covid-related restrictions across the world. Despite the impact that this pandemic has had on our lives, our hard-working Local Organising Committee, Dr Jane Williams, Prof. Natalie Waran and Dr Hayley Randle have brought together an exciting and varied programme of plenary lectures and research presentations. While we cannot come together physically to share the learning, enthusiasm and renewing and making new connections that we have enjoyed in previous years, we do have a bigger attendance than ever registered for this year's conference. Huge thanks are due to both our sponsors and our organising committee, but the attendance figures are also an indication of the growing awareness of, and interest in, the area of Equitation Science.

Under the theme headings 'Science with Impact', 'Tools for Change', 'Communication for Change' and 'Training for Education', this year's invited plenary and keynote speakers share their vast experience, insights and aspirations concerning various aspects of the chosen themes. Dr David Marlin will address the challenge of transferring valuable knowledge, which is now available - from scientists to the general horse population so that the information we have can actually bring about a difference for the horse. Dr Andrew McLean, drawing on his experience and involvement with Pony Club Australia and also of educating elephant trainers in Asia, will examine and compare progress achieved in both groups on changing mindsets and behaviour. The barriers to change that exist among specific equestrian populations will be explored by Prof. Natalie Waran, and the influence of choice of word will be discussed by Dr Camie Heleski - in particular, how the choice of word can influence emotional reactions.

Dr Celeste Wilkins will describe her doctoral research exploring rider biomechanics - how best to achieve harmony between horse and rider. The application of cognitive and affective neuroscience to horse training and welfare will be addressed by Cathryn Henshall, Dr Desiree Brucks will present on self-control in horses and the question of how science can be used to improve equine quality of life will be discussed by Dr Hayley Randle. Opening the conference, the Clever Hans lecture by Prof. Mike Mendl will share his knowledge on emotion, and decision-making in animals.

I am confident that this exciting programme will inspire renewed effort and energy among delegates, hopefully filled with fresh ideas, information and scientific findings to help bring about change for the horse, as a result of this conference. I invite all who are not already members of our society to join ISES, and look forward to hopefully meeting many new faces at next year's event to be held at Hartpury, UK.

Enjoy and thank you for joining us.

Orla Doherty, Honorary President, ISES

ISES 2021 LOCAL CONFERENCE ORGANISING COMMITTEE

Prof. Natalie Waran (Eastern Institute of Technology, New Zealand)
Dr Jane Williams (Hartpury University, UK)
Dr Hayley Randle (School of Agricultural, Environmental and Veterinary Sciences, Charles Sturt University, Australia)

ISES 2020 SCIENTIFIC COMMITTEE

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Janne Winther-Christensen (Aarhus University, Denmark
Kate Fenner (Kandooequine)
Camie Heleski (University of Kentucky, US)

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Nic deBrauwere (Redwings, UK)
Camie Heleski (University of Kentucky, US)
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Colleen Brady (Purdue University, U.S.)
Uta König von Borstel (Giessen University, Germany)

THE ISES 10 TRAINING PRINCIPLES

Human and horse welfare depend upon training methods and management that demonstrate:

1.Regard for human and horse safety

- Acknowledge that horses' size, power and potential flightiness present a significant risk
- Avoid provoking aggressive/defensive behaviours (kicking /biting)
- Ensure recognition of the horse's dangerous zones (e.g hindquarters)
- Safe use of tools, equipment and environment
- Recognise the dangers of being inconsistent or confusing
- Ensure horses and humans are appropriately matched
- Avoid using methods or equipment that cause pain, distress or injury to the horse

"Disregarding safety greatly increases the danger of human-horse interactions"

2.Regard for the nature of horses

- Ensure welfare needs: lengthy daily foraging, equine company, freedom to move around
- Avoid aversive management practices (e.g. whisker-trimming, ear-twitching)
- Avoid assuming a role for dominance in human/horse interactions
- Recognise signs of pain
- Respect the social nature of horses *(e.g. importance of touch, effects of separation)*
- Avoid movements horses may perceive as threatening (e.g jerky, rushing movements)

"Isolation, restricted locomotion and limited foraging compromise welfare"

3.Regard for horses' mental and sensory abilities

- Avoid overestimating the horse's mental abilities *(e.g. "he knows what he did wrong")*
- Avoid underestimating the horse's mental abilities *(e.g. "It's only a horse…")*
- Acknowledge that horses see and hear differently from humans
- Avoid long training sessions (keep repetitions to a minimum to avoid overloading)
- Avoid assuming that the horse thinks as humans do
- Avoid implying mental states when describing and interpreting horse behaviour

"Over- or underestimating the horse's mental capabilities can have significant welfare consequences"

4.Regard for current emotional states

- Ensure trained responses and reinforcements are consistent
- Avoid the use of pain/constant discomfort in training
- Avoid triggering flight/fight/freeze reactions
- Maintain minimum arousal for the task during training
- Help the horse to relax with stroking and voice
- Encourage the horse to adopt relaxed postures as part of training (e.g. head lowering, free rein)
- Avoid high arousal when using tactile or food motivators
- Don't underestimate horse's capacity to suffer
- Encourage positive emotional states in training

"High arousal and lack of reinforcement may lead to stress and negative affective states"

5.Correct use of habituation/desensitization/calming methods

- Gradually approach objects that the horse is afraid of or, if possible, gradually bring such aversive objects closer to the horse (systematic desensitization)
- Gain control of the horse's limb movements (e.g step the horse back) while aversive objects are maintained at a safe distance and gradually brought closer (over-shadowing)
- Associate aversive stimuli with pleasant outcomes by giving food treats when the horse perceives the scary object (counter-conditioning)

- Ignore undesirable behaviours and reinforce desirable alternative responses (differential reinforcement)
- Avoid flooding techniques (forcing the horse to endure aversive stimuli)

"Desensitization techniques that involve flooding may lead to stress and produce phobias"

6.Correct use of Operant Conditioning

- Understand how operant conditioning works: i.e. performance of behaviours become more or less likely as a result of their consequences.
- Tactile pressures (e.g. from the bit, leg, spur or whip) must be removed at the onset of the correct response
- Minimise delays in reinforcement because they are ineffective and unethical
- Use combined reinforcement (amplify pressure-release rewards with tactile or food rewards where appropriate)
- Avoid active punishment

"The incorrect use of operant conditioning can lead to serious behaviour problems that manifest as aggression, escape, apathy and compromise welfare"

7.Correct use of Classical Conditioning

- Train the uptake of light signals by placing them BEFORE a pressure-release sequence
- Precede all desirable responses with light signals
- Avoid unwanted stimuli overshadowing desired responses (e.g. the horse may associate an undesirable response with an unintended signal from the environment)

"The absence of benign (light) signals can lead to stress and compromised welfare"

8.Correct use of Shaping

- Break down training tasks into the smallest achievable steps and progressively reinforce each step toward the desired behaviour
- Plan training to make the correct response as obvious and easy as possible
- Maintain a consistent environment to train a new task and give the horse the time to learn safely and calmly
- Only change one contextual aspect at a time (e.g. trainer, place, signal)

"Poor shaping leads to confusion"

9.Correct use of Signals/Cues

- Ensure signals are easy for the horse to discriminate from one another
- Ensure each signals has only one meaning
- Ensure signals for different responses are never applied concurrently
- Ensure locomotory signals are applied in timing with limb biomechanics

"Unclear, ambiguous or simultaneous signals lead to confusion"

10.Regard for Self-carriage

- Aim for self-carriage in all methods and at all levels of training
- Train the horse to maintain:
  - gait
  - tempo
  - stride length
  - direction
  - head and neck carriage
  - body posture
- Avoid forcing any posture
- Avoid nagging with legs, spurs or reins i.e. avoid trying to maintain responses with relentless signaling.

"Lack of self-carriage can promote hyper-reactive responses and compromise welfare"

SCIENTIFIC PROGRAMME

Day 1 | 20th-21st October

Conference opening & Theme 1: Science with Impact

Time zones BST|CET|AEST (21st) |NZDT (21st)|EST|CST|PDT

1920|2020|0520|0720|1520|1420|1220 Sponsors Via Nova, Hartpury University & Haygain		**Conference opening address**. *President Dr Orla Doherty*
1930|2030|0530|0730|1530|1430|1230 Sponsor Via Nova		**Clever Hans lecture:** Animal emotion and decision-making: an integrative framework. *Prof. Mike Mendl*
2030|2130|0630|0830|1630|1530|1330		**Break**
2045|2145|0645|0845|1645|1545|1345		**Theme: Science with Impact** (Chair *Dr Katrina Merkies*)
Sponsor World Horse Welfare	PL1	**Plenary** Brain train your horse! The application of cognitive and affective neuroscience to the training and welfare of horses. *Cathrynne Henshall*
2130|2230|0730|0930|1730|1630|1430		**Research presentations (pre-recorded)**
	RP1	Defining hyperflexion: an investigation of head and neck positions and behaviour in ridden dressage horses. *Kathrin Kienapfel*
	RP2	Classical counter conditioning promotes a positive affective state during a nerve blocking procedure in a randomised, blinded clinical trial. *Gemma Pearson*
	RP3	Behavioural response to variations in reinforcer value and delivery delay during positive reinforcement training of gelding horses (*Equus caballus*). *Sue Bennett*
	RP4	Know your noseband: an exploration of factors that influence riders' choice of noseband. *Hilary Clayton*
	RP5	Anxiety and behaviour of the domestic horse (*Equus caballus*): are behavioural assessments, physiology, and questionnaires a reliable measure of stress? *Bethany Winspear*
2235|2335|0835|1035|1835|1735|1535 Sponsor Hartpury University	K1	**Keynote** The APPliance of Science - can it be used to improve Equine Quality of Life? *Hayley Randle*
2300|0000|0900|1100|1900|1800|1600 Sponsor Equestrian Canada		**Panel** Chair *Roly Owers* Panel members *Natalie Waran, Camie Heleski, Nic deBrauwere, Hayley Randle, Kirsty Laroche.*
2330|0030|0930|1130|1930|1830|1630		**Day 1 Close**
		Theme 1 Science with Impact pre-recorded lightning presentations Poster introduction *Dr Jane Williams*
	LT1	Effects of bitted vs. bitless bridles on horses' behaviour and eye temperature: preliminary findings. *Linda Greening*
	LT2	Horse welfare during summer: shelter access reduces insect-avoidance behaviour in pastured horses in Denmark. *Janne Winther Christensen*
	LT3	Horses' ability to solve transposition tasks. *Maria Rørvang*
	LT4	An investigation into the relationship between rider pelvic asymmetry and equine pelvic asymmetry in relation to the use of physical therapy. *Kayleigh Holmes*
	LT5	Heart rate variability (HRV) in horses, validation of equipment and methods. *Richard Mott*
	LT6	Group housing in horses: the effect of social interactions on horses' heart rate. *Denise Hebesberger*

	LT7	The effect of age and pregnancy on olfactory interest in horses. *Klára Nicova*
	LT8	Foal behaviour during artificial weaning is modulated by maternal behaviour experienced peri-natally. *Aline Bouquet*
	LT9	Potential behavioural indicators of affective state in stabled horses. *Ella Bradshaw*
	LT10	Differences in conflict behaviours in ridden equids wearing bitted or bitless bridles while undertaking halt trials. *Rose Scofield*
	LT11	Rider assessment of saddle position. *Marina Douglas*
	LT12	Getting a grip: a potential rider impact? *Hayley Randle*
	LT13	When technology may not translate: are pedometers on horses a step too far? *Hayley Randle*
	LT14	The effect of three-legged weight bearing stance on the activity of the rectus abdominus muscle. *Raquel Butler*

Day 2 | 21st-22nd October

Themes 2 and 3: Tools for Change & Communication for Change

Time zones BST|CET|AEST (22nd)|NZDT (22nd)|EST|CST|PDT

1900|2000|0500|0700|1500|1400|1200		**Introduction to day 2** *Prof. Natalie Waran*
Sponsors Haygain, Via Nova & Hartpury University		
1915|2015|0515|0715|1515|1415|1215		**Theme 2 Tools for Change** (Chair *Dr Janne Winther Christensen*)
Sponsor Goodbye Flys	PL2	**Plenary** Analysing the rider in motion: challenges, perspectives and potential impacts on equine quality of life. *Celeste Wilkins*
2000|2100|0600|0800|1600|1500|1300		**Break**
2015|2115|0615|0815|1615|1515|1315		**Research presentations (pre-recorded)**
	RP6	Co-operative care protocol using protected contact and positive reinforcement to facilitate simulated veterinary intra-muscular injections in horses. *Sam Osborn.*
	RP7	Measuring stress-related parameters in the human-horse interaction during an obstacle course. *Chantal Kaptejin*
	RP8	Why the long face? – horses show distinct facial expressions during agonistic and affiliative interactions. *Kate Lewis*
	RP9	Development of a chronic pain monitoring instrument for owner recognition of osteoarthritis pain in horses through behavioural indicators. *Diane Howard*
	RP10	Personality in horses: how to distinguish between the different coping styles and do owner-horse pairs have similar personality traits? *Sabrina Briefer*
2100|2200|0700|0900|1700|1600|1400	K2	**Keynote** Assessing self-control abilities in horses with a delay of gratification paradigm. *Desiree Brucks*
Sponsor Via Nova		
2120|2220|0720|0920|1720|1620|1420		**Break**
2130|2230|0730|0930|1730|1630|1430		**Theme 3 Communication for Change** (Chair *Dr Kate Fenner*)
Sponsor The Horse Trust	PL3	**Plenary** Challenges in preaching further than the choir and the congregation to improve horse welfare. *David Marlin*
2215|2315|0815|1015|1815|1715|1515		**Research presentations (pre-recorded)**
	RP11	Movement as medicine: horse owner perceptions of the potential for movement and exercise as opportunities to improve welfare. *Cynthia Naydani*
	RP12	It's just an emotion: exploring horse owner perceptions of equine emotions. *Hayley Randle*
	RP13	Investigation of a potential link between UK equestrians' understanding learning theory, and their perception of and response to problem behaviour. *Ellie Girgis*
	RP14	How happy are equine athletes? stakeholder perspectives on equine welfare issues associated with equestrian sport and industry use of welfare assessment tools. *Tamzin Furtado*

	RP15	Addressing Thoroughbred welfare and management issues post-racing. *Glenys Noble*
2320|0020|0920|1120|1920|1820|1620 Sponsor Haygain	K3	**Keynote** The power of word choice – case in point, the whip/crop debate. *Dr Camie Heleski*
2350|0050|0950|1150|1950|1850|1650		**Day 2 Close**
		Theme 2 Tools for Change pre-recorded lightning presentations
		Poster introduction *Dr Jane Williams*
	LT15	Relationship between behaviour assessed during stallion licensing and licensing results. *Uta König von Borstel*
	LT16	Evaluation of appropriate water and roughage supply and potential causes of injuries in horse husbandry in Germany - a field study with Besttupferd. *Sandra Kuhnke*
	LT17	Assessing horse welfare in single and group housing with the assessment tool Besttupferd: results of the indicators injuries and species-appropriate turnout. *Miriam Baumgartner*
	LT18	Social proximity as a positive welfare indicator in horse husbandry. *Miriam Baumgartner*
	LT19	Preliminary investigation into the effects of chiropractic treatment and combined with pulsed electromagnetic field therapy on mechanical nociceptive thresholds of horses. *Laura Davey*
		Theme 3 Communication for Change pre-recorded lightning presentations
		Poster introduction *Dr Jane Williams*
	LT20	An investigation into UK equestrians' understanding and use of learning theory in ridden horse training. *Susan Mooney*
	LT21	An exploration of the language used by UK leisure horse owners when discussing equine quality of life. *Becky Smith*
	LT22	What advice do equine physiotherapists provide in 72 hours following intervention. *Rochelle Dunster*
	LT23	An investigation into self-perception of body image in female equestrians in the UK thoroughbred racing sector. *Sofia Forino*
	LT24	Development and validation of a test to identify whether a horse is broken or unbroken before travelling. *Barbara Padalino*
	LT25	Influence of rider weight; rider skill and horse conformation on horses' behaviour during riding. *Uta König von Borstel*
	LT26	Results of a survey to investigate which existing quality of life assessment tools are most feasible for equestrians to use under general field conditions. *Loni Loftus*
	LT27	Horse trailer design in Australia: well informed or best guess? *Hayley Randle*
	LT28	Shade and shelter use in paddock kept horses in Australia. *Marina Douglas*
	LT29	Associations between commonly used apparatus and conflict behaviours reported in the ridden horse in Australia. *Victoria Condon*
	LT30	Micro-behavioural responses of horses to familiar stimuli in the presence and absence of humans wearing a mask: implications for equine care during COVID-19. *Chris Pawson*
	LT31	UK horse owner perceptions of factors impacting equine emotional state and barriers to making positive welfare changes. *Kate Fletcher*
	LT32	Optimising horse welfare: is best practice really best fit? *Hayley Randle*
	LT33	Does the start of flat races influence racehorse race performance? *Isobel Wells*

Day 3 | 22nd-23rd October

Theme 4: Training for Education

Time zones BST|CET|AEST (23rd)|NZDT (23rd)|EST|CST|PDT

1900|2000|0500|0700|1500|1400|1200 Sponsors Hartpury University, Via Nova & Haygain		**Introduction to day 3**. *Prof. Natalie Waran*
1915|2015|0515|0715|1515|1415|1215		**Theme 4 Training for Education** (Chair *Camie Heleski*)
Sponsor Hartpury University	PL4	**Plenary** Leading the change - a new era for pony club education. *Andrew Mclean*
2000|2100|0600|0800|1600|1500|1300		**Research presentations (pre-recorded)**
	RP16	No more long faces? investigating a means of improving student understanding of and attitude towards equidae on animal management courses. *Sarah Todd*
	RP17	The effect of wearing a headcollar or bridle on the scoring of horses (*Equus caballus*) using the Horse Grimace Scale. *Amanda Gates*
	RP18	An investigation into the perception, understanding and level of application of equine learning theory by UK equestrians. *Charlotte Douglas*
	RP19	A listener analysis of an equine science-based podcast, whose aim is to bridge the gap between scientists and horse enthusiasts for knowledge transfer and improved horse welfare. *Nancy McLean*
	RP20	The usefulness of blindfolding horses as a handling method. *Katrina Merkies*
2100|2200|0700|0900|1700|1600|1400		**Break**
2110|2210|0710|0910|1710|1610|1410 Sponsor Charles Sturt University	K4	**Keynote** Harnessing the power of education for advancing equine welfare. *Natalie Waran*
2140|2240|0740|0940|1740|1640|1440		**Break**
2200|2300|0800|1000|1800|1700|1500		**Closing address & Prize presentation** *Local Conference Organising Committee* **Hand-over to Hartpury 2022** *Rosie Scott-Ward*
		Theme 4 Training for Education pre-recorded lightning presentations
		Poster introduction *Dr Jane Williams*
	LT34	Why the heck is my horse erect? the investigation of dropping behavior in male horses during training. *Olivia Franzin*
	LT35	Set in stone: how is horse welfare depicted in equestrian statues throughout time and cultures? *Desiree Brucks*
	LT36	The effect of elastic reins on rein tension and performance in dressage horses. *Hayley Randle*
	LT37	Retraining of racehorses: attributes associated with successful post-racing careers. *Stephanie Evans*
	LT38	A study to investigate the use of side-reins in lunged horses. *Paloma Osborne*
	LT39	A multiple correspondence analysis on the feeding and management practices of Australian horse owners. *Claudia McCleay*

BIOGRAPHIES OF CLEVER HANS SPEAKER, PLENARY SPEAKERS, KEYNOTE SPEAKERS, PANEL MEMBERS, SESSION-THEME CHAIRS AND LOCAL ORGANISING COMMITTEE

Clever Hans lecture speaker

Mike Mendl | Professor Bristol University

Mike obtained his PhD in animal behaviour at Cambridge University. He then took a Royal Society European Research Fellowship to continue his work on behavioural development at Groningen University in the Netherlands, before returning to work at Cambridge University Vet School where he moved into the field of applied animal behaviour and welfare, studying the effects of housing systems on pig welfare. He subsequently took up a position as a Behavioural Scientist at the Scottish Agricultural College in Edinburgh, continuing his work on pig behaviour and welfare, and then moved to Bristol University Vet School where he is now Professor of Animal Behaviour and Welfare and Head of the Bristol Animal Welfare & Behaviour Group, and has previously been Deputy Head of School (Research). He is also lead of the BBSRC and UFAW Animal Welfare Research Network.

His current research interests are in the study of cognition, emotion, and social behaviour in domestic animals, with a view to using this information to improve animal welfare. Together with Dr Liz Paul, he developed a novel 'cognitive bias' approach to the assessment of animal emotions which draws on theory and findings from human psychology and cognitive neuroscience. He and Liz received the 2013 inaugural International Society for Applied Ethology Creativity Award, and the Alice Richie Trust Memorial Fund Award for their work in this area. Mike was awarded the UFAW Medal in 2014 for his contributions to animal welfare science, and the RSPCA/BSAS Award for Innovative Developments in Animal Welfare in 2015.

Mike also works on more applied animal welfare issues with current interests including developing welfare indicators and monitoring systems that can be implemented under field conditions, and better understanding the relationship between housing and husbandry procedures and the health and welfare of farm, laboratory, companion and zoo animals.

Plenary speakers

Cathrynne Henshall | Charles Sturt University PhD Candidate

Cath Henshall recently submitted a PhD thesis investigating the effects of stress and exercise on equine cognition and welfare, applying a cognitive and affective neuroscience lens to the interpretation of equine learning behaviour and welfare. Cath has worked in a variety of roles providing animal welfare expertise to government and industry organisations in the field of participant education, animal welfare law enforcement and professional development in animal welfare assessment and management to industry officers.

Cath has recently been a guest lecturer at Western Sydney University and Charles Sturt University in the fields of animal welfare and equine behaviour and prior to that, taught equine studies and livestock production welfare in the NSW vocational education system. Cath also ran a horse training and rider education business before commencing her PhD studies and is appreciating having the time to finally hang out with her small herd of seven horses and simply enjoy their company.

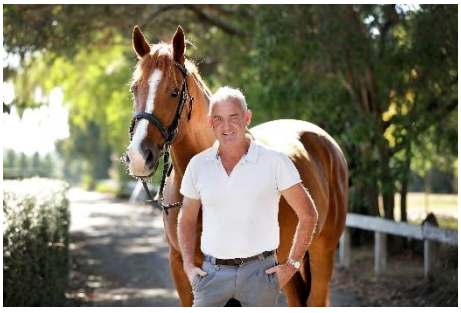
Celeste Wilkins | Lecturer Hartpury University

Celeste investigated equestrian rider biomechanics with a focus on rider coordination in her PhD. She is a Lecturer in Sport and Equine Biomechanics at Hartpury University; her role also includes research and commercial activity in the Margaret Giffen Rider Performance Centre at Hartpury. She has coached riders and delivered workshops to all ages in Canada and the UK. As a rider, she enjoys showjumping, dressage and forming a bond with a horse.

Dr David Marlin | Independent researcher and equine expert, owner of DrDavidMarlin.com

David has been involved with horses all his life. He studied physiology and computing at Stirling University and then went on to train with acclaimed dressage rider and coach Judy Harvey. In 1989 he obtained his PhD from the UK's leading sports university, Loughborough University following a four-year STUDY of the responses of Thoroughbred racehorses to exercise and training, undertaken at the renowned Animal Health Trust in Newmarket. He has since held numerous scientific posts within the equine industry including advising on thermoregulation and transport of horses for the 1996 Atlanta Olympic Games, and air-conditioning and cooling for horses at the 2008 Beijing Olympic Games and most recently safeguarding the welfare of horses competing at the 2020(21) Tokyo Olympics. He was the Senior Scientist and Head of Physiology at the world-renowned Animal Health Trust. David has published over 200 scientific papers on physiology, exercise and horse health. David is passionate about equine welfare and engaged in numerous projects in these areas, along with evaluation of the design and impacts of horse related equipment. David is current president of the UK National Equine Welfare Council.

Dr Andrew McLean | Director Equitation Science International and Pony Club Australia



Andrew is a clinical ethologist and his specialist academic areas are Animal Cognition, Equine learning/training and Welfare science. Andrew has authored and co-authored numerous research and review journal papers and a number of horse and elephant training texts. In 2020 he co-authored the most recent Five Domains Model of Animal Welfare, focusing on human-animal interactions. An Honorary Fellow and Trustee of the International Society for Equitation Science, Andrew has been co-winner of the Eureka Science award and the Premio Flambo Award for Animal Welfare (Italian Equestrian Sports Federation). In 2014 he was awarded the John H Daniels Fellowship from the USA National Sporting Library, Virginia. Professionally, Andrew founded and directed the Australian Equine Behaviour Centre and is currently the CEO of Equitation Science International. Co-founder of the International Society for Equitation Science, Andrew is also Chairman and Co-Founder of the Human Elephant Learning Programs Foundation. He is presently a Director of Pony Club Australia where he has instigated a revolutionary syllabus that leads the world in equestrian education for young riders. Andrew has enjoyed a decorated equestrian sport career and has represented Australia in three-day eventing and competed in State and National titles in FEI dressage, eventing and show-jumping. He was an Olympic Academy delegate in 1991 and Australian Champion (30+ age) in Tetrathlon in 2018. In addition, Andrew was the former and founding President of the Victorian Event Riders Association and former President of the Tasmanian Eventing Association.

Keynote speakers

Hayley Randle | Assoc. Prof. Equine Science Charles Sturt University

Hayley is Associate Professor of Equine Science at Charles Sturt University, Australia. Before emigrating to Australia in 2016 she worked at Duchy College and Plymouth University in the UK, as an Academic Lead and Researcher. She has made significant contributions to the Quality Assurance of degree level courses in the UK through her work as a QAA reviewer for over a decade. She is passionate about animal welfare and makes national and international contributions. She has an Australian government appointed Animal Welfare advisory role, is an active member of The National Primary Industries Animal Welfare Research, Development and Extension Strategy (NAWDRES) and two international journal Associate Editor (equine specialism) roles. She has been with ISES since its inception and has held the Honorary roles of Secretary, Junior Vice President, President and Senior President. She is now an ISES Honorary Fellow and ISES Trustee and has been actively involved in shaping the ISES strategies including as a Positive Influencer for the next five years. She has worked tirelessly with a very supportive Equine Science team at Charles Sturt University to produce a contemporary and very popular set of degree courses within the School of Agricultural, Environmental and Veterinary Sciences, where she is also an Associate Head of School. She likes nothing more than seeing her students thrive, and is very proud of both her undergraduates contributing to change in the equine industry and post graduate students engaged in cutting edge equitation science research. In her spare time she enjoys spending time with her two horses and three ponies, two kelpies and border collie and trying to be creative making social media videos of her dirt bike crazy son.

Désirée Brucks | University of Giessen

I am a behavioural biologist interested in the link between animal cognition and welfare. Currently I am a postdoc at the University of Giessen in Germany. In particular, I am interested in understanding how animals navigate their social world and which underlying mechanisms govern individual differences, such as self-control abilities.

Camie Heleski | Lecturer University of Kentucky

Camie Heleski received her Ph.D. in Animal Science with an emphasis in equine behavior and welfare. She worked at Michigan State University for 25 years in their Horse Management Program. In 2016, she began teaching at the University of Kentucky in the Equine Science and Management program. Her applied research interests have revolved around equine behavior and welfare, horse-human interactions and working equids in developing regions of the world. More recently she has become especially interested in racehorse welfare and social license to operate principles. She has been actively involved with the International Society for Equitation Science since its inception.

Prof. Natalie Waran | Professor (One Welfare) Executive Dean Eastern Institute of Technology

Natalie (Nat) is an internationally recognised animal behaviour and welfare scientist based in New Zealand. She gained a first class Zoology degree from Glasgow University, and her PhD from Cambridge University's Veterinary School funded by the British Veterinary Association's Animal Welfare Foundation. She has been a Professor of Animal Welfare since 2005, working as Head of School and Associate Dean (Research) at Unitec and then back in the UK where she was the inaugural Director of the Jeanne Marchig International Centre for Animal Welfare Education at Edinburgh University's Royal (Dick) School of Veterinary Studies. During that time she developed and used a 'one welfare' approach for advancing animal welfare in developing countries. She moved back to NZ in 2016 to become the Professor of One Welfare at the Eastern Institute of Technology, where she is an Executive Dean. She holds honorary and visiting Professorships at Edinburgh, Nottingham Trent and Hartpury Universities, and she is the current chair of Companion Animals New Zealand. Although she has worked on a range of species and welfare concerns, she has a special interest in horse behaviour and welfare, having published and spoken on a range of equine related topics over the past 25 years. She is a co-founder of equitation science, and Hon fellow and trustee of the international society.

Panel members

Mr Roly Owers MRCVS | Chief Executive, World Horse Welfare

Roly is a qualified veterinary surgeon and has been Chief Executive of the charity World Horse Welfare since 2008. He graduated from Cambridge University in 1992 and acquired his Masters degree in Nutrition from the London School of Hygiene and Tropical Medicine in 1997. After graduating from Cambridge, he briefly worked for the Blue Cross animal charity before joining the Royal Army Veterinary Corps for a seven-year period.

Roly plays an active role in much of World Horse Welfare's work supporting the horse-human partnership across four continents, including leading the charity's work with the EU, OIE and United Nations. He also leads the charity's work with horse sport, advising the International Equestrian Federation (FEI), the International Horse Sports Confederation (IHSC) and the British Horseracing Authority on horse welfare, along with other national federations. Roly is currently Chair of the International Coalition for Animal Welfare (ICFAW), which represents animal welfare to the OIE, Treasurer of the World Federation for Animals (WFA) and of the British Equine Veterinary Association (BEVA), Chairman of the UK Equine Disease Coalition, a Director of the British Horse Council and a Board member of the European Horse Network.

Nicolas de Brauwere MRVCS | Head of Welfare and Behaviour Redwings Horse Sanctuary & Chair National Equine Welfare Council

Nicolas graduated as a veterinary surgeon in 1991 from Onderstepoort in South Africa and began working at Redwings Horse Sanctuary later the same year, providing clinical services and helping to develop preventative horse health programmes. Nic was also asked to support investigations into allegations of cruelty and neglect, involving close partnership-working with other organisations. A particular interest in feral horses and horse behaviour arose from Redwings' work to help address a range of welfare problems affecting feral ponies on commons in South Wales and Bodmin Moor. Through these experiences, Nic developed a broader interest in horse behaviour and equitation science. Over time, partnership working on rescues and educational projects has become the norm and the benefit of NEWC as a unifying voice for horse welfare more apparent. Since joining the NEWC management board in 2004/05 and becoming Chair in 2009, Nic has helped the Council develop its role in leading and coordinating communication and collaboration in the welfare sector and wider equine world.

Kristy Laroche | Director Equestrian Canada

Kristy Laroche's professional career revolves around the development of sustainable agriculture and equine industries in Canada. After graduating from the University of Guelph's Agriculture-Equine option program, she has spent time working in a Thoroughbred breeding facility, providing nutritional consulting for a custom feed mill, and grooming for a high performance equine athlete. Kristy has also worked to develop policies on a national level, such as the Canadian Sheep Federation's Canadian Verified Sheep Program. In her current position at EC, Kristy is passionate about collaborating with the Equine Industry Development Committee, Health and Welfare Committee, and Breed Sports Committee to improve horse welfare and promote the growth of all equestrian disciplines across Canada. Kristy is currently directing two impactful projects; the development of the Equine Animal Care Assessment Program, and the Equine ID & Traceability national platform.

Hayley Randle & Natalie Waran – see keynote speakers

Session Chairs

Katrina Merkies | Associate Professor University of Guelph

Dr Merkies is the faculty advisor for the Bachelor of Bio-Resource Management degree program in Equine Management at the University of Guelph, ON, Canada. She also teaches undergraduate courses in equine management, event management, equine reproduction and integrated projects. She manages a small research program involving equine behaviour, welfare, management mainly focused on the horse-human relationship especially in equine-assisted activities. Outside of academic life, Dr Merkies is the honorary secretary for ISES and on the board of trustees for the Donkey Sanctuary of Canada. She enjoys training dogs in her spare time and competes in rally obedience and rally freestyle.

Janne Winther Christensen | Associate Professor Aarhus University

Janne Winther Christensen is an Associate Professor in the Behaviour and Stress Biology group at Aarhus University, Denmark. Janne has studied the behaviour of Przewalski horses in the Askania Nova Reserve in Ukraine, and her fascination of wild equids and the similarities in behaviour between wild, feral and domestic horses has formed the basis for her research. Janne holds a Licentiate degree from the Swedish University of Agricultural Sciences (2006), and a PhD in ethology from Copenhagen University (2008). The focus of her licentiate and PhD projects was on fear reactions and habituation in horses. Her current research focuses on (i) maternal influence on the development of foal behaviour, (ii) learning and training of horses, and (iii) social behaviour and welfare in relation to housing and management.

Kate Fenner | ISES Media Officer

I am a research affiliate with the University of Sydney and recently accepted a fulltime lecturing position in the School of Agriculture and Food Sciences at the University of Queensland. I look forward to introducing equitation science to the curriculum and involving and engaging undergraduate and postgraduate students. I am also still active in industry with Kandoo Equine, delivering online training internationally and providing 'Science in the Saddle' clinics and demonstrations (locally for the past two COVID years but I'm hoping internationally again soon).

Camie Heleski – see keynotes speakers

Local Conference Organising Committee

Natalie Waran – see keynote speakers

Jane Williams | Head of Research Hartpury University

Jane is an Associate Professor and Head of Research at Hartpury University. She is an experienced researcher, with a passion for enhancing equine performance and wellbeing through industry-informed, real-world research that generates change. Jane gained her Masters in Equine Science before completing her doctorate exploring the application of surface electromyography as a tool to assess muscle adaptation during training in racehorses and sport horses. Her main areas of professional interest include scientific evaluation of equestrian performance, training and wellbeing, rider impacts on equitation, reliability assessment across equestrian science and veterinary physiotherapy, and human-animal interaction. Jane co-edited and authored 'Training for Equestrian Performance' with Dr David Evans, to showcase how science and research can be applied practically to improve performance for horses and their riders. She also edited 'The Complete Textbook of Animal Health and Welfare' a guide for owners and students. She is also incoming President and a Trustee of the International Society of Equitation Science, which promotes the application of objective research and advanced practice, to improve the welfare of horses in their associations with humans.

Hayley Randle – see keynote speakers

KEY INFORMATION ABOUT ISES 2021 PRESENTATIONS AND ABSTRACTS

Plenaries are denoted by PL.
Research presentations are denoted by RP.
Keynote presentations are denoted by K.
Lightning talks are denoted by LT.

Abstracts are arranged in the order in which they appear in the schedule (pages 15-18). They commence on page 27.

LINKS TO RECORDED PRESENTATIONS AND THEME SUMMARIES

Please note that these will be available to non-members until 20th December 2021.
After this date copies of the presentations will only be available to ISES members.

Day 1 | Theme 1 Science with impact

Day 1 summary animation https://vimeo.com/637275667

Clever Hans Lecture Plenary 1 (Henshall)	https://vimeo.com/638553010/c9e96b77e0
Research Presentations 1-5	https://vimeo.com/631838356/fce10b4cb5
Keynote 1 (Randle)	https://vimeo.com/632837978/89883d8201
Lightning Presentations 1-14	https://vimeo.com/631803859/51191bc673

Day 2 | Theme 2 Tools for change

Day 2 summary animation part 1 https://vimeo.com/637823665

Plenary 1 (Wilkins)	https://vimeo.com/638553816/ab9a6f43ce
Research Presentations 6-10	https://vimeo.com/631839761/ca5638bfb1
Keynote 1 (Brucks)	https://vimeo.com/632839935/97f252f22d
Lightning Presentations 15-19	https://vimeo.com/631771079/9979ae658f

Day 2 | Theme 3 Communication for change

Day 2 summary animation part 2 https://vimeo.com/638143156

Plenary 1 (Marlin)	https://vimeo.com/638553816/ab9a6f43ce
Research Presentations 11-15	https://vimeo.com/631845616/e1c0de502f
Keynote 1 (Heleski)	https://vimeo.com/632835893/cfbd17db7e
Lightning Presentations 20-33	https://vimeo.com/631771079/9979ae658f

Day 3 | Theme 4 Training for education

Day 3 summary animation https://vimeo.com/638933397

Plenary 1 (McLean)	https://vimeo.com/638611103/72f91f145f
Research Presentations 16-20	https://vimeo.com/631849078/1cd852a8b1
Keynote 1 (Waran)	https://vimeo.com/632836720/1c48403e2f
Lightning Presentations 34-39	https://vimeo.com/631806278/e57efd733

CLEVER HANS LECTURE

ANIMAL EMOTION AND DECISION-MAKING: AN INTEGRATIVE FRAMEWORK

Mike Mendl

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Clever Hans demonstrated how skilled horses are at attending to and learning about the predictive value of human behaviour. In recent years, studies of equine cognition have proliferated accompanied by increasing interest in the effects that housing and husbandry, interaction with humans, horse personality, and stressors can have on cognitive function. Rather than summarising the disparate findings that emerge - this has already been nicely done in recent published reviews - I will focus on the plausible suggestion that many of the observed effects on cognition may be mediated by the horse's emotional (affective) state. The aim of my talk will be to introduce a modern reinforcement learning theory perspective on the links between animal emotion and decision-making that provides a framework for identifying different steps in a decision-making process; *attending* to external information, identifying *decision options*, selecting a *decision action*, responding to the *decision outcome*. I will discuss how these steps are both dependent on previous affective experiences and influenced by current affective states, referring to relevant equine examples and providing an operational definition of animal emotion along the way. I hope that this framework will offer a way of thinking about how affective states may influence cognitive mechanisms and hence how they can impact on aspects of equine training. At the same time, a horse's attentional and decision-making processes may themselves be used to provide an insight into its emotional state and welfare.

DAY 1 THEME 1: SCIENCE WITH IMPACT

PL1

BRAIN TRAIN YOUR HORSE! THE APPLICATION OF COGNITIVE AND AFFECTIVE NEUROSCIENCE TO THE TRAINING AND WELFARE OF DOMESTIC HORSES

C. Henshall

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Equitation scientists have identified that the application of research in cognitive and affective neuroscience to the training of horses has considerable potential to improve horse welfare and human safety. Yet despite this, its translation to industry contexts is still limited. Equine learning likely relies on the same neural processes observed in other species. Due to a lack of techniques to directly probe equine brain function, the translation of these findings to horses is necessarily inferential, however validated methodologies bridging this gap in human studies can be applied to research in horses. In human-horse interactions, behaviour provides the interface between neural activity and horses' responses to training and environmental stimuli. Providing owners with a greater understanding, even at a simplified level, of the putative neural processes underpinning behaviour could assist them to improve their practices. This paper canvasses three areas of neuroscience research with relevance to domestic horses: stress and exercise effects on learning, chronic stress and cognitive flexibility and the role of prediction errors for interpreting horses' responses during training, to demonstrate the potential benefits of this approach.

In other species, exposure to stress and exercise that alters concentrations of neurotransmitters such as cortisol, noradrenaline, dopamine and brain derived neurotrophic factor as well as patterns of activity in relevant brain regions has been shown to influence learning and behaviour. Common husbandry and training practices can cause stress system activation in horses. There is evidence that equine cognition is particularly sensitive to impairment as a result of stress exposure, likely due to high concentrations of cortisol and noradrenaline. Training methods that induce such effects may impair learning. Little is known experimentally about the effects of exercise on equine cognition, however research in other species suggests it is beneficial. A recent experiment has confirmed this in horses and this finding could be adapted to training routines to improve learning acquisition.

Cognitive flexibility is the ability to adapt behaviour in dynamic environments. Domestic horses are routinely required to show cognitive flexibility such as when they undergo retraining for unwanted habits or are used for a new discipline. Habits and cognitive flexibility develop under the influence of activity in two distinct, overlapping neural networks. Chronic stress may bias activity in the habit network at the expense of the flexible learning network, impairing the animal's ability to adapt when situations change. Anecdotally, trainers report that even with extensive retraining, unwanted habits readily recur and this may expose horses to poor welfare outcomes if they are viewed as being deliberately disobedient. We know little about cognitive flexibility in horses, the best methods to retrain unwanted habits or how to prevent their return, particularly using aversive learning protocols relevant to industry settings. A recent experiment identified that although chronic stress did not impair the acquisition of an industry-type aversive cognitive flexibility task (reversal of the direction of a locomotory response), the cumulative effect of learning-related and environmental stress made horses more likely to make perseverative errors, returning to the old habit. This finding has practical relevance to the design and implementation of industry retraining programs.

Another area where neuroscience research has the potential to assist owners interpret their horses' responses during training is the concept of the 'prediction error'. Prediction errors are the gap between an expected outcome and the outcome that eventuates. They have been described as a neural 'teaching signal' underpinning the motivational drives that facilitate learning. Prediction errors signal when outcomes are better than expected (positive valence) or worse than expected (negative valence), as well as outcome value. They occur in appetitive and aversive learning contexts and heterogenous neural networks track errors across the brain including cognitive, instrumental learning and emotion coding regions. The valence and value of prediction errors are signalled by the release of various neurotransmitters, particularly dopamine. The pattern of release signals to the animal whether to change or repeat its behaviour. In aversive instrumental learning, prediction errors signal when an expected aversive outcome is omitted (positive valance) or an unexpected aversive outcome is received (negative valance). When an unexpected aversive outcome is experienced, dopamine release is inhibited, generating a negatively valanced prediction error that motivates the animal to cease its current activity and engage in a new activity to escape the aversive outcome.

In learning theory, the behavioural effects of this neural activity have been conceptualised as punishment (decrease in response vigour/frequency) and reinforcement (increase in response vigour/frequency to escape/avoid aversive stimuli). However this conceptualisation focusses on the intention of the person applying the stimulus rather than what the horse may experience. Irrespective of whether an aversive stimulus is *intended* to punish or reinforce behaviour, its effectiveness relies on both its aversive characteristics and the behavioural responses that result in its termination. In prediction error terms, the application of the stimulus is an aversive outcome (punishment), and the subsequent removal of the stimulus is a beneficial outcome (reinforcement). The use of any aversive stimulus that causes an ongoing behaviour to cease and whose termination results in the performance of a separate behaviour is likely to be experienced on a continuum from punishment to reinforcement. This sequence is likely to be signed by alterations in dopamine release (prediction error signal) which motivate behavioural responses to the stimuli. Horse failures to respond as expected during training could be due to a lack of clarity in the teaching signal provided by prediction error coding neurons, a low value assigned to the error or conflict about the appropriate behavioural response to resolve the error. Adding the prediction error concept to existing models currently in use to interpret responses during training along with the use of markers of neural activity, such as spontaneous eyeblink rate (dopamine activity) could provide more clarity about the putative causes of apparent training failures as well as a more nuanced window into the horse's experience of training.

The cognitive capacities of horses are well characterised, largely via appetitive protocols. However aversive instrumental learning predominates in industry and there is considerable heterogeneity in neuronal activity and neurotransmitter release accompanying learning about appetitive versus aversive stimuli. Consequently there is a need for ongoing research in equine cognition using aversive instrumental and Pavlovian learning protocols that mirror industry conditions. The findings of cognitive and affective neuroscience, combined with existing knowledge from psychology, welfare assessment and ethology can assist researchers to develop relevant, practical advice to help owners utilise their horse's cognitive capacities to achieve effective, ethical and sustainable training outcomes.

Lay person message: The application of research in the neuroscience of learning and emotions to the routine training of horses could assist owners to improve their handling and training practices to enhance their horse's ability to acquire and repeat learning tasks whilst safeguarding their welfare. Of particular relevance is how factors such as stress and exercise and the functioning of brain regions and neural networks affect what horses learn and remember.

Keywords: Cognitive; affective neuroscience; stress; exercise; prediction error; instrumental learning; flexibility

RP1

DEFINING HYPERFLEXION: AN INVESTIGATION OF HEAD AND NECK POSITIONS AND BEHAVIOUR IN RIDDEN DRESSAGE HORSES

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Hyperflexion/Rollkur/LDR has been scientifically proven as compromising factor in horse welfare. However, hyperflexion is not clearly defined besides the nasal plane located somewhere behind the vertical. Is a noseline behind the vertical always Hyperflexion or in graduations "just deep riding"? To answer this, the commonly used head and neck positions (HNPs) and ethological indicators for stress of ridden elite dressage horses were investigated. For the study, 140 horses (Grand Prix Special CDIO5* (n = 47), warm-up GP Special (n = 53), national GP Bern (n = 15) and elite riders from WEhorse (n = 25)) were evaluated. For each horse-rider pair, three minute-video-captures of riding in intensive working phases were analysed. The HNPs were evaluated with a newly developed annotation tool (Humboldt University, Berlin) by calculating the means of the angle of the nasal plane at the vertical (VA), the poll angle (PA) and the angle of neck and shoulder (SA) in every frame in profile view (10,737 frames) with four markers set in each frame (mouth, poll, shoulder, withers). Behavioural parameters associated with conflict (CB), such as tail swishing, unusual oral behaviour and head-tossing were continuously assessed with the focus animal method by scientists in the Observer XT (Noldus). Threshold intervals of VA in relation to the amount of CB were identified: In intervals of 0° - 1.6° and 2.1° - 5.7° behind the vertical, significant differences were found in CB shown by the horses (t-tests, d.f. = 139, $p < 0.05$). As example, horses with their nasal plane more than 5.7° behind the vertical showed more CB than the horses with their nasal plane less behind the vertical (142.91 ± 70.16 vs. 113.45 ± 65.84, $t = 2.50$, d.f. = 139, $p < 0.05$). In the interval of 5.8° - 15° behind the vertical, only few significant differences between the amount of CB were found. VA correlated significantly with PA. The higher VA was, the smaller was PA ($r = -0.69$, $p < 0.05$). SA had no correlation to CB. CB was significantly correlated with PA and VA ($r = -0.34$, $p < 0.05$; $r = 0.23$, $p < 0.05$). This brings the HNP again into focus as an objectively measurable animal welfare indicator in ridden horses. A VA more than 5.7° behind the vertical seems to compromise the welfare of ridden horses, regardless of SA. This could provide evidence for setting a defined threshold for practical situations.

Lay person message: While horse riding, the welfare of the animals has to be assured. Hyperflexion compromises welfare, but this head and neck position is not fully understood in industry. Detailed analyses of head-neck-positions and conflict behaviour associated with 140 horses showed a possible definition of hyperflexion as holding the nasal plane more than 5.7° behind the vertical, no matter how high the head is held. Understanding that the horse's head neck position as an important welfare indicator could help to safeguard horse welfare during horse riding.

Keywords: Hyperflexion, Rollkur, conflict behaviour, equine welfare, equine performance

RP2

CLASSICAL COUNTER CONDITIONING PROMOTES A POSITIVE AFFECTIVE STATE DURING A NERVE BLOCKING PROCEDURE IN A RANDOMISED, BLINDED CLINICAL TRIAL

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Lameness is the most common health problem in the UK equine population and nerve blocks are commonly performed to localise the source of pain. However, the nerve block procedure can be stressful for the horse and veterinarians are at significantly increased risk of sustaining injuries such as a fracture, unconsciousness or hospitalisation compared to other veterinary procedures. The aim of this study was to determine whether classical counter conditioning (CCC) during the preparation phase would positively influence a horse's perception of a nerve block. Cases (n=27) presenting for lameness investigation were recruited and randomly assigned to CCC (n=13) or control (n=14) groups. The CCC group were trained to associate a person approaching their limb with the provision of food during the preparation phase. The control group received no training. The handling of the horse during the nerve block was at the discretion of the veterinarian performing the procedure. Horses were filmed during the nerve block and these segments were evaluated first, using a quantitative ethogram and second, using Qualitative Behaviour Assessment (QBA), with a fixed term list, in a randomised order by 5 independent observers blinded to treatment group. Physiological data were also collected but not presented. QBA scores were subject to principal component analysis (PCA). The 1st PCA explained 33% of the variation and was considered to represent affective state. Linear mixed effects regression models were then performed on the factor scores from the 1st PCA to determine significant relationships with multiple variables. The model of best fit included the following independent variables: observer, limb, block number, type of block and veterinarian, with segment number and horse ID as random effects. In this model horses in the CCC group were scored as being in a significantly more positive affective state then controls (estimate=0.63, SE=0.253, t.ratio=2.49, p=0.02). The CCC group also received more nerve blocks (2.7 per horse) than controls (1.7). The quantitative behavioural data had a weak but significant association with the PCA factor scores (Spearman rho=0.118, p=0.042). In summary, CCC can be used to produce a more positive affective state when performing nerve blocks. Further investigation is now needed to determine if this results in fewer occupational injuries sustained during this procedure and how else quality of life can be optimised in horses undergoing veterinary care.

Lay person message: A nerve block is commonly used to determine the source of pain in lame horses and can be stressful for horses and may result in injury of the veterinarian. By pairing the approach to the horse's leg with offering food, during the preparation phase the horses were scored as being in a more positive emotional state during the nerve block than horses who did not have food associated with preparation for the nerve block procedure. This may reduce occupational injuries and optimise equine quality of life during veterinary care.

Keywords: classical counter conditioning; nerve block; veterinary; equine; emotional state, welfare

RP3

BEHAVIOURAL RESPONSES TO VARIATIONS IN POSITIVE REINFORCEMENT METHODS IN TRAINING GELDING HORSES (EQUUS CABALLUS)

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As evidenced by the increasing academic literature interest in equine positive reinforcement, the equine R+ community is growing. Increased use of food to reinforce desired behaviours has revealed unwanted behaviour during training including biting, nipping, invading trainer space, and penile tumescence. A 2017 pilot survey of owners using R+ with male horses indicated high reinforcement value and trainer inexperience was linked to the incidence of penile tumescence. Training techniques used during positive reinforcement vary and may contribute to these unwanted behaviours. We examined the effect of reinforcer delay and reinforcement quality on equine learner motivation and behaviour. Sixteen geldings, naïve to R+ using acoustic markers, were trained to touch a target and assigned a randomized treatment order. Treatments consisted of low and high value reinforcers in combination with 5 and 13 second delay between behaviour and reinforcer delivery. Low-value reinforcers included a small amount of chopped hay or a small unsweetened forage replacer cube. Following preference assessment, high value reinforcement included a random combination of carrot, molasses/oat horse muffin, and dried hay cubes containing carrot shreds. Target presentation and treat delivery techniques were standardized to assure all movement remained within the horse's eyesight. Investigation was conducted in three large stables, using large stalls with a stall guard as a training station with two cameras capturing front and lateral views. Forty behaviours were observed in four categories including: trainer contact, attention focus, stereotypy, and penile tumescence. Data were analyzed using a two-by-two repeated measure ANOVA. Horses made contact with the trainer more frequently when in the delay condition ($F_{1,13}$=8.59, p=0.012). Trainer exploration duration was affected by delay (Mean=17.42, $F_{1,13}$=5.73, p=0.033) and quality ($F_{1,13}$=5.59, p=0.034). Frequency of behaviour change was affected by quality ($F_{1,13}$=12.21, p=0.004). Horses were more likely to leave the stall doorway and task in long delay conditions (Mean=5.10, $F_{1,13}$=15.60, p=0.002) than in short delay (Mean=1.84). Penile tumescence was not significantly impacted by these variables. Results reveal that reinforcer value and delivery delay may impact equine behaviour during positive reinforcement.

Lay person message: Sixteen geldings were trained using low and high-value reinforcers combined with short and long delivery delays to explore how trainer choice may influence equine behaviour. Four behavioural categories were investigated including trainer contact, attention focus, stereotypy and penile dropping. Results reveal that reinforcer value and delivery delay may impact equine behaviour during positive reinforcement.

Keywords: positive reinforcement; reinforcement quality; reinforcement delay; motivation; behaviour

RP4

KNOW YOUR NOSEBAND: AN EXPLORATION OF FACTORS THAT INFLUENCE RIDERS' CHOICE OF NOSEBAND

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The popularity of equestrian sports provides an increasing market for horse tack. While manufacturers have launched new designs to enhance the safety, comfort, effectiveness and aesthetics of their products, few items of tack have been evaluated quantitatively. Nosebands are widely used across equestrian sport. Despite this, little is known about factors which influence rider decision-making when selecting what noseband to use for their horse. A 41-question online survey distributed via equestrian social media sites evaluated how riders select and fit nosebands, what factors influence decision-making, and sources of information that inform practice. Frequency analysis and Kruskal-Wallis analyses identified differences in noseband selection, use and fit between recreational and competitive riders. Thematic analysis evaluated riders' decision-making in more detail. In total, 1381 respondents completed the survey. Horse performance, comfort and control, customary habit to use and appearance were key factors that informed rider decision-making when selecting a noseband. The use of cavesson (34%) and flash (20%) nosebands was prevalent across riders for recreational riding, flatwork and jumping; these nosebands were perceived as kind and comfortable for the horse. Differences in the use of crank nosebands ($p<0.01$) and additional padding under the noseband ($p<0.02$) were found between disciplines. Most respondents (79%) had changed their horse's noseband at least once; when more control was required, riders used nosebands incorporating a strap passing below the bit e.g. flash and grackle nosebands. If the bridle or noseband was thought to be causing pain or injury to the horse, most respondents (95%) changed the noseband. Preferred sources of information were veterinarians, equine dentists and coaches, with few consulting a qualified bridle fitter. Most respondents agreed there should be room for 2-3 fingers beneath a correctly adjusted noseband; 44% had experienced their horse's noseband tightness being checked at competition, however only 14% recognised the ISES taper gauge. Increased communication of the value of using trained bit and bridle fitters, and the ISES taper gauge to assess noseband fit to riders is warranted.

Lay person message: Little is known why riders select specific nosebands to use on their horse. An online survey was completed by 1381 riders; comfort and control, using the same noseband through habit, and appearance were key reasons used to select nosebands. Most riders indicated they would change their horse's noseband if they thought it was painful and they fitted nosebands with 2-3 fingers space below them, however few had ever had their noseband tightness checked. Increased education on noseband fit including using the ISES taper gauge is recommended.

Keywords: horse-riding; equestrian sport; tack; bridle; equine performance; equine welfare; noseband

RP5

ANXIETY AND BEHAVIOUR OF THE DOMESTIC HORSE (*EQUUS CABALLUS*): ARE BEHAVIOURAL ASSESSMENTS, PHYSIOLOGY, AND QUESTIONNAIRES A RELIABLE MEASURE OF STRESS?

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The ability to cope with demanding environments differs between individual animals. Domesticated horses (*Equus caballus*) are exposed to a range of aversive stimuli, often causing stress and anxiety. Being able to accurately measure their emotional state helps to ensure appropriate welfare needs are being met. There are various approaches to measuring anxiety in horses, with behavioural observations arguably being the most widespread. Similarly, questionnaires are regularly being used, despite participant bias often being a leading criticism. Recently, studies are considering the use of physiological processes (temperature, pulse, respiration, and glucocorticoids) as an indication of stress. This study attempts to evaluate the reliability of these methods using data collected on 28 leisure horses (3 to > 30 years old) from 8 stable yards (stabled in the winter and grass-kept in the summer), with similar care and exercise routines. The level of anxiety of the horses was rated by a qualified riding instructor (familiar with all subjects) and by the individual owners of the horses based on 15 questions assessing the general behaviour of their horses on a Likert scale between 1 and 5. Behavioural observations to score anxiety levels were conducted during a mild aversive stimulus (mock coat clipping for 1 minute each on both sides of the crest of the neck, front legs and flanks). Physiological measures (temperature, pulse, and respiration) were taken before and after the clipping procedure. Finally, the duration to cross a plastic sheet was used to assess the horse's response to an unusual environment. The questionnaire ratings significantly correlated with each other (Spearman's $\rho = 0.741$, $p < 0.001$) and the behavioural score (ρ from 0.425 to 0.631, $p \leq 0.01$). Horses that were rated as more anxious by the instructor and the behavioural score crossed the plastic sheet faster (ρ from –0.43 to –0.44, $p \leq 0.01$) and had a higher pulse change and baseline respiration (ρ from 0.31 to 0.59, $p \leq 0.05$), whereas the correlations with the owner ratings did not reach significance (all Spearman's Rho <0.28, p>0.08). The high correlation between behavioural scores and questionnaire ratings suggest that short-term observations reflect typical anxiety levels. Also, anxiety levels reflect underlying stress physiology and the behavioural response to an unusual environment, but the correlations are weaker, suggesting additional factors are at play. Assessments by the horse owners seem least reliable, potentially due to lack of experience and subjective judgement biases, which should be investigated further.

Lay person message: Accurate measures of horse anxiety are important for ensuring their welfare. Studying 28 horses, we found that owners, an expert, and behavioural observations broadly agree about horse anxiety levels. The expert and the behavioural anxiety score, but not the owner score, also predicted how the horses responded to mild, aversive stimuli (mock clipping, plastic sheet). This suggests that independent, objective anxiety assessment is more reliable than subjective judgements of owners which may be biased.

Keywords: anxiety; behaviour; physiology; welfare assessment; questionnaires; stress

K1

THE APPLIANCE OF SCIENCE: CAN TECHNOLOGY BE USED TO IMPROVE EQUINE QUALITY OF LIFE?

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We need to do the best we can to ensure that we manage our horses appropriately, ethically and sustainably, if we are to safeguard their welfare, wellbeing and promote a good quality of life. With the introduction of the Five Domains Model framework for assessing animal welfare, and the recent interest in using it to assess equine welfare, the role of animal-based indicators is becoming increasingly acknowledged. Contemporary assessments of equine welfare now go beyond the provision of resources and include behavioural and physiological measurements obtained at the individual animal level. This means that behavioural, physical and physiological parameters can be used in combination to provide a more comprehensive assessment of the animal's physical and mental state and consequently indicate likely quality of life. However the increasing eagerness to assess internal states, such as emotions that often lack validated or consistent characteristics, especially positive affective states, may lead to a tendency to default to anthropomorphic interpretations of equine behaviour and observations such as facial expressions.

The use of technology in equestrianism is not new. In 1877 Eadweard Muybridge used multiple cameras and his zoopraxiscope to reveal the moment suspension in a galloping horse that is not detectable by the human-eye, and in so doing, shaped future investigation of equine locomotion. Various forms of technology have been successfully applied in the construction and control of the physical environments in which horses are kept, train and compete, in clinical contexts and in the design and manufacture of innovative equipment reportedly designed to improve equine welfare.

As an active research-based organisation the International Society for Equitation Science has embraced the use of technology to help meet its aim of using evidence-based findings to improve all aspects of horses' interactions with humans. Regardless of measurement tool, research into equine wellbeing must be rigorous, robust and reliable if it is to be taken seriously by those responsible for the care and welfare of horses. It also needs to be relevant, realistic and repeatable if recommendations based on its outcomes are to shape practice and ultimately promote good equine quality of life. Smartphones, tablets, laptops and smartwatches have become increasingly portable and affordable, whilst bluetooth and wifi technology has undergone significant development as has data storage capability. Augmented Reality, Virtual Reality and Artificial Intelligence is also becoming available to practitioners, educators and researchers alike. All technology-based measurement tools need to be appropriately prepared, regularly calibrated and validated for use in horses to ensure results are robust and valid. Rigorous experimental design will ensure that we are not side-tracked by the volume of data generated by technology and that we are fully able to answer our equine welfare and quality of life research questions.

Lay person message: As horse practitioners, keepers and trainers we need to do the best we can to ensure we manage our horses ethically and sustainably, if we are to safeguard their welfare, wellbeing and promote a good quality of life. Technology comes in many forms and can be used to measure horse welfare by providing objectivity, however we need to make sure that it is recording information that is valid and reliable.

Keywords: technology; equine; welfare; research; practice; education

LT1

EFFECTS OF BITTED VS. BITLESS BRIDLES ON HORSES' BEHAVIOUR AND EYE TEMPERATURE: PRELIMINARY FINDINGS

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Evidence exists to promote the benefits of bitless bridles on horse welfare and performance, however such studies are largely conducted under dynamic conditions. More recently investigations into the effect of noseband tightness have been conducted under static conditions allowing for greater control over independent and environmental variables. The aim of this study, therefore, was to compare eye temperature and behaviour whilst the horse was sedentary and wearing a head collar vs. their usual bitted bridle vs. a bitless bridle. Three mares and four geldings, all naïve to wearing a bitless bridle, and of various ages (mean 12.5±7.5 years), breeds, and heights (153.3±11.2cm), receiving similar levels of ridden exercise wearing a bitted bridle, were observed whilst stood in stocks for ten minutes under the three conditions, which were randomized. Video footage and focal continuous sampling was used to record frequency of chewing and licking and the occurrence of specific facial expressions from the EquiFACs ethogram. A thermal imaging camera (FLIR C5) was used to continuously record eye temperature, and an average temperature under each condition was determined from data taken at minute intervals. A one way ANOVA (with Tukeys post hoc) was used to test for significant differences between conditions ($P<0.05$). On average eye temperatures (°C) were greater under bitless conditions, but no significant differences were found. The frequency of 'raised inner brow' was significantly higher ($F=80.316$, d.f.=2, $P<0.0001$) for the bitted bridle (mean frequency=13.71) when compared with the bitless bridle (mean frequency=7.86) and the head collar (mean frequency=1.86). Significant differences were reported for 'raised upper eyelid' between head collar and bitted conditions ($P=0.003$) and head collar and bitless conditions ($P=0.046$), but not between bitted and bitless. Horses wearing bitted bridles displayed a higher frequency of 'eye white' ($P=0.042$) and chewing behavior ($P=0.019$) when compared to wearing a head collar, but significant differences were not found between bitted and bitless conditions. Results suggest horses are more relaxed wearing a head collar when compared to the responses displayed whilst wearing a bitted bridle. Horses were naïve to the bitless bridles thus may not have experienced anticipatory associations with ridden work, however higher eye temperatures suggest an acute stress reaction in response to this novel stimulus. Overall, differences in behavioural responses to bitted vs. bitless bridles whilst static suggest less discomfort is experienced when wearing the bitless bridle.

Lay person message: The use of a bitted bridle during ridden work has been reported to increase risk of oral injury and long-term damage. Bitless bridles exist as an alternative however many equine organizations continue to make the use of bitted bridles mandatory for competition. The current study adds to existing evidence that can be used when making decisions with regards the use of bitless vs. bitted bridles.

Keywords: bridle; eye temperature; behaviour; horse; welfare; thermography

LT2

HORSE WELFARE DURING SUMMER: SHELTER ACCESS REDUCES INSECT-AVOIDANCE BEHAVIOUR IN PASTURED HORSES IN DENMARK

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Pasture access is key to equine quality of life as it ensures free movement and usually provides opportunity for natural foraging behaviour as well as access to social contact with companions. During summer, however, insect prevalence may cause periodic discomfort. This study investigated the effect of shelter access on horses' behavioural and physiological responses on days with varying insect prevalence as determined by insect trap captures. We included 39 horses in 9 groups (n=21 with shelter access and n=18 without access, 3-5 horses per group, balanced for treatment within each of three locations). We recorded insect-avoidance behaviour (e.g. tail swishing, head tossing, self-grooming and skin shivering) and faecal cortisol metabolites (FCM) one day per week for eight weeks during mid-summer. Three different types of insect traps were used: H-traps for capture of Tabanids, light traps for mosquitoes and biting midges, and sticky paper traps as previously used in other studies. Particularly H-trap captures of Tabanids were related to insect avoidance responses in the horses (Total avoidance behaviour per horse per min, median [25; 75% quartiles]: 0 Tabanids caught: 26.8 [12.1; 49.8]; 1-5 Tabanids caught: 50.6 [36.5; 68.3]; >5 Tabanids caught: 66.6 [48.6; 83.4], Kruscal-Wallis, H=73.6, P<0.001). Insect-avoidance behaviour was significantly lower in horses with indoor access (Total avoidance behaviour per horse per min, Indoor access: 36.7 [17.4; 56.1] vs. No access: 57.9 [33.9; 81.2], Mann-Whitney, U=7444, P<0.001). Concentrations of FCM did not differ significantly between days with low vs. high insect prevalence (RM ANOVA, F=1.6, P=0.19). The subsequent year, we conducted a small follow-up study on 13 horses (n=6 with shelter access and n=7 without) and recorded behaviour and saliva cortisol on four selected summer days with either low or high Tabanid prevalence (2 'low' and 2 'high' days). On 'high' days, saliva cortisol increased significantly only in horses without shelter access (RM ANOVA, F=5.6, P=0.009). These results suggest that horses may be challenged by the presence of Tabanids and other insects, which can be mitigated by provision of shelters. The results can help inform management practices and improve equine quality of life.

Lay person message: Pasture access is key to equine quality of life and recommendations state that horses should be given daily access to pasture (see e.g. EU guide for keeping of horses, 2019). During summer, however, insects can cause periodic discomfort in pastured horses. In this study, shelter access reduced insect-avoidance behaviour and shelter access may therefore improve horse welfare during periods of high insect activity.

Keywords: behaviour; cortisol; insects; pasture; shelter; welfare

LT3

HORSES ABILITY TO SOLVE TRANSPOSITION TASKS

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Object permanence refers to an individual's understanding that an object continues to exist even though it is out of its sight. In their daily management, horses are often faced with novel and sudden stimuli (re-)appearing from occluded areas that potentially may elicit stress responses. Knowledge of horses' ability to track hidden objects can thus shed light onto how horses represent physical objects in their environment. This study aimed to investigate if horses were able to follow visible and invisible transpositions of objects. Secondly, the study examined whether specific individual characteristics (such as age, training level, sex and coat colour (red or other colour)) influenced horses' performance. The study included 39 Icelandic horses aged 2–25 years, of varying training levels. The horses were exposed to three tasks: a) choice test (n=37), b) visible transposition task (n=35), and c) invisible transposition task (n=31). Prior to the tests, all horses were trained to follow a target (small black box), which horses had to locate in the tests on either side (i.e. left or right) on a sliding board: In the choice test, the target was not moved only occluded by a white bowl. In the visible transposition task, the target was moved in full view of the horse before being covered. In the invisible transposition task, the target was moved while occluded. 27 horses in the choice test, and 8 horses in the visible transposition task, performed significantly better than expected by chance on the individual level, while none did so in the invisible transposition task (minimum 9/10 trials correct, binomial test, $p<0.05$). This was also reflected in their group performance (only choice and visible transposition task above chance level, one-sample Wilcoxon test, $V_{choice}=666$, $p<0.05$ and $V_{visible}=400$, $p<0.05$). In the invisible transposition task, the group performed significantly worse than expected by chance (one-sample Wilcoxon test, $V_{invisible}=63$, $p < 0.05$) indicating that horses persistently chose the side where they had last seen the target. None of the other factors included in the study had an effect on performance of the horses ($GLMM_{choice}$, fixed factors: $p>0.05$, $GLMM_{visible}$, fixed factors: $p>0.05$ and $GLMM_{invisible}$, fixed factors: $p>0.05$). In conclusion, horses were able to solve visible but not invisible transposition tasks. It is likely that the latter ability may not have been biologically relevant to horses, as navigating an open habitat does not require the mental representation of complex invisible transpositions of food sources or con-/heterospecifics.

Lay person massage: In their daily management routines, horses can be faced with novel and sudden stimuli (re-)appearing that potentially may elicit stress responses. We here show that horses are able to solve visible transposition tasks, but not invisible tasks. In practical terms, our results indicate that we can expect horses to follow and remember the previous placement of visible objects in their environment, but we cannot expect horses to follow these objects if moved while occluded.

Keywords: cognition; mental abilities; object permanence; horse training; equids

LT4

AN INVESTIGATION INTO THE RELATIONSHIP BETWEEN RIDER PELVIC ASYMMETRY AND EQUINE PELVIC ASSYMETRY IN RELATION TO THE USE OF PHSYICAL THERAPY

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There is increasing use of physical therapy for both horse and rider but limited scientific research linking the horse, the rider and their symmetry together. Pelvic asymmetry can indicate musculoskeletal imbalance and affect performance. Asymmetry of the horse and rider partnership is a challenging and complex area. Physical therapy may have an impact on the pelvic asymmetry of both the horse and the rider as independent parties. This study aimed to investigate the hypothesis that single horse/rider combinations who have regular (4 or more times per year) physical therapy will have improved pelvic symmetry than horse/rider combinations that have no physical therapy. Fifty single horse (age, 6-14yrs) and rider (age, 18-45yrs) combinations (minimum 6-month partners) were selected with inclusion/exclusion criteria. Treatment group(n=25) horse and rider had both received regular physical therapy (chiropractic, osteopathy, physiotherapy or sports massage therapy). The control group (n=25 pairs), received no physical therapy treatment for a minimum of 1 year prior to the study. On level ground, triplicate measurements of horse tuber coxae (TC) heights (stood square) and rider anterior superior iliac spine (ASIS) (feet@30cm) to floor were taken using a plumb line. All measurements for both horses and riders were taken by the same person, blinded to the groups. Symmetry indices (SI) were calculated from raw data. Data were tested for normality (Shapiro Wilk test) and Mann Whitney test, regression analysis used with level of statistical significance at $p<0.05$. There was a significant difference between treatment and control groups of pelvic symmetry values for horses (mean SI± SD: control,4.69±2.48; treatment,2.35±0.61, $p<0.0001$) and riders (mean SI± SD: control,3.4±1.25; treatment,2.11±0.88, $p<0.0001$). There was no significant correlation between horse TC and rider ASIS asymmetry means for treatment group ($r^2=0.04$, $F=0.95$, $p=0.34$) or control group ($r^2=0.01$, $F=0.29$, $p=0.6$). This study provides positive evidence that regular use of physical therapy for both horses and riders may improve pelvic symmetry measures of the horse and rider individually. In this study there was no relationship between the amount of pelvic rotation symmetry of the horse and the rider ASIS pelvic symmetry. Further research would now be warranted to investigate the effects of individual physical therapy on specific pelvic symmetry measures for both horse and riders individually and as a pair and in relation to performance parameters to investigate this relationship further.

Lay person message: Pelvic asymmetries can alter body mechanics which may affect performance. Physical therapy to improve pelvic symmetry is increasingly provided for both horses and riders. This study shows that when horses and riders receive regular physical therapy, the pelvic symmetry of both improves compared to horses and riders receiving no physical therapy. This should be an encouragement to riders to not only look after their horses but themselves as well.

Keywords: asymmetry; pelvis; symmetry; horse; rider; therapy

LT5

HEART RATE VARIABILITY (HRV) IN HORSES, VALIDATION OF EQUIPMENT AND METHODS

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Heart rate variability (HRV) is commonly used in equine science as an implied measure of welfare. The accurate detection of inter-beat intervals (IBIs) in horses is complicated due to their ECG waveform morphology and a high incidence of 2nd-degree atrioventricular (AV) block in clinically normal animals at rest. The current study aimed to validate the use in horses of two heart rate monitors designed for use in humans (Polar V800 and Actiheart 5). IBI data, collected from a mixed sample (n=17) of general riding horses using Polar V800 and Actiheart 5 monitors was compared against a veterinary ECG (Televet 100). Synchronous 30 min recordings were made with all 3 devices, whilst horses were at rest. HRV analysis was conducted using Kubios software. Time (RMSSD) and frequency (HF Power) domains were compared for each device, with a range of artefact correction levels, using the Bland Altman test of agreement in R Studio. Acceptable limits were defined *a priori* as a bias within 5% of the sample median for that parameter and with the 95% CI of that bias encompassing 0. RMSSD acceptable bias < ±4 ms and HF Power acceptable bias < ±128 ms^2. For a sub-set (n=13) of horses without substantial dysrhythmias (<2%), data from the Actiheart 5 produced the best agreement with the ECG data (RMSSD bias of 0 ms (95% CI -2 ms – 1 ms) and an HF Power bias of 45 ms^2 (95% CI -51 ms^2 - 141 ms^2)). An acceptable level of agreement was achieved between the Polar V800 data and the ECG data when the Polar V800 data had a 0.4 sec artefact correction applied (RMSSD bias of 0 ms (95% CI -2 ms – 3 ms) and an HF Power bias of -90 ms^2 (95% CI -505 ms^2 - 325 ms^2)). For horses at rest, HRV data obtained from the Actiheart 5 is interchangeable with a Televet 100, but the Polar V800 data requires an artefact correction of 0.4 sec.

Lay person message: Personal heart rate monitors designed for human fitness training can be a useful tool for the assessment of aspects of horse welfare, but due to peculiarities of the horse's heartbeat, care must be taken when processing the data to ensure that the results are reliable. Data from the Actiheart 5 can be manually processed to provide high quality data but the data obtained from the Polar V800 is also acceptable with appropriate mathematical correction.

Keywords: Heart Rate Variability; equine; Polar V800; Actiheart 5; electrocardiogram; welfare assessment

LT6

GROUP HOUSING IN HORSES: THE EFFECT OF SOCIAL INTERACTIONS ON HORSES' HEART RATE

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Current equine welfare guidelines recommend housing systems that allow horses to socialise regularly to enhance horses' quality of life. However, little is known whether agonistic interactions among group-housed horses constitute a source of social stress and whether affiliative interactions correspond to a positive emotional state. Therefore, we assessed whether agonistic interactions among horses living in established social groups cause a stress response and whether affiliative interactions facilitate a relaxation effect. We studied the effect of social interactions on heart rate **in** 15 horses of different breeds and housed together in established groups between 66 and 100 per cent of their time. Using the Polar® V800 Equine monitor and video recordings, we collected heart rate data during 596 spontaneously occurring agonistic interactions, 416 short affiliative interactions such as sniffs, touches, head rubs, and 37 grooming events when ranging freely in their fields. For comparisons, heart rate was measured during behaviours of similar physical activity, such as standing and walking. This study received ethical approval from Anglia Ruskin University and followed ISAE[3] and ASAB[4] guidelines for research with animals. The most frequent interactions were mild threats which corresponded to a heart rate increase of 1.56 ± 1.09 (median ± IQR) beats per minute. Thereby, heart rate did not differ from walking, a behaviour of similar physical activity level (Wilcoxon signed-rank test: n=14, V=0.241, P=0.241). Only around ~1% of all agonistic interactions were of high intensity, which facilitated a heart rate increase of 23.05 ± 18.32 (median ± IQR) beats per minute. Due to the low number of occurrences, only descriptive statistics are given. During short affiliative interactions, the heart rate did not differ from standing, a behaviour of similar physical activity (Wilcoxon signed-rank test: n=14, V=0.211, P=0.286). However, during grooming, the heart rate was significantly lower (~8%) than during standing (Wilcoxon signed-rank test: n=8, V=26, P=0.046, r=-0.53). These findings indicated that agonistic interactions mainly were of low intensity in established horse groups and did not induce a significant stress response. High-intensity agonistic interactions, which were rarely occurring, corresponded to a pronounced increase in heart rate. Consequently, we recommend that horse owners regularly monitor behaviour among group-housed horses as frequently occurring high-intensity aggression could have negative welfare implications. The lower heart rate during grooming indicated a calming effect. This suggests that allowing horses to engage in mutual grooming may promote relaxation and positive welfare.

Lay person message: To meet horses social needs group housing is recommended. During social interactions among free-roaming horses, heart rate was measured to investigate whether they caused a stress response or relaxation effect. Aggression among horses of established groups mainly was of low intensity and did not cause a stress response. A high frequency of high-intensity aggression could, however, be of a welfare concern. Conversely, mutual grooming provoked a strong relaxation effect, indicated by a low heart rate.

Keywords: group housing; agonistic interactions; affiliative interactions; social stress; welfare; relaxation

LT7

THE EFFECT OF AGE AND PREGNANCY ON OLFACTORY INTEREST IN HORSES

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The sense of olfaction plays a key role in the development and expression of behaviour in mammals. In spite of this, olfaction is rarely considered in horse training and equitation science. Knowledge about the olfactory abilities of horses is thus sparse although there may be potential to use olfaction in various situations. In this study, we investigated olfactory abilities of horses in a Habituation/Dishabituation test. The test relies on repeated presentation of the same odour resulting in decreased sniffing duration (habituation), whereas subsequent presentation of a new odour reinstates sniffing duration (dishabituation). Four odours: peppermint(P), orange(O), lavender(L) and cedar wood(C) were presented to 36 Icelandic horses (aged: 0-25 years) in a balanced order. The direct observation of each horse placed in front of the horse's individual pen where each odour was presented three times in a row for a duration of 1 min each with an inter-trial pause of 2 min to horse followed another odour. The response variable was sniffing duration per presentation and behavioural reaction (licking, biting, snorting and backing). Horses were able to detect and distinguish between all four odours and sniffed peppermint significantly longer (Wilcoxon Signed Rank test $O1^{st}$ vs $P1^{st}$: V=68, P<0.001, $L1^{st}$ vs $P1^{st}$: V=20, P<0.001, $C1^{st}$ vs $P1^{st}$: V=47, P<0.001). Horses displayed significantly more licking behaviour when presented with peppermint (Fishers Exact test OR=4.40, P=0.068) compared to cedar wood or lavender and more horses expressed biting behaviour when presented to peppermint compared to lavender. There was no effect of sex (males vs females) on sniffing duration for any odours (Wilcoxon-Man-Whitney test P>0.05) or on the behavioural reaction (Fishers Exact test P > 0.05). Young horses (n=14, 0-5 years old), sniffed cedar wood significantly longer than older horses (Wilcoxon signed rank test F=10, P=0.004). Pregnant mares (n=8) sniffed lavender less (Wilcoxon signed rank test V=93, P=0.02) than non-pregnant mares (n=17). Behaviours indicative of aversiveness (i.e. snorting and backing) did not increase over time of trials (regardless of odour), and horses expressing these behaviour´s during a first presentation did not necessarily express them in subsequent presentations. In conclusion, horses were able to detect and distinguish between the four different odours, their interest varied with age and pregnancy status and the Habituation/Dishabituation test seemed a suitable task for equines.

Lay person message: Some odours can be attractive for horses while others can lead to avoidance behaviour. Therefore, limited knowledge of horse´s olfaction poses a risk in understanding of horses´ behaviour in equestrian practice. Horses were able to detect and distinguish between 4 odours: peppermint, orange, lavender and cedar wood, and sniffed peppermint longer than all other odours. Horses´ sniffing duration varied with age and pregnancy status, younger horses sniffed cedar wood longer, and pregnant mares sniffed lavender less.

Keywords: age effect; pregnancy; odour; interest; smell; sensory ability

LT8

FOAL BEHAVIOUR DURING ARTIFICIAL WEANING IS MODULATED BY MATERNAL BEHAVIOUR EXPERIENCED PERI-NATALLY

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Artificial weaning (i.e. abrupt, and earlier than natural maternal-offspring separation) is common practice in the equine industry and one of the most stressful events for foals. In addition to short-term negative welfare effects, artificial weaning can lead to development of abnormal behaviour and Equine Gastric Ulcer Syndrome, which negatively impact long-term quality of life and reduce horse monetary value. Early life experiences, e.g., maternal offspring-directed licking, can influence stress reactivity during adulthood in other species. However, despite their crucial importance in determining adult welfare and quality of life, little is known about mare influences on foal behaviour development and stress reactivity. We aimed to investigate peri-natal maternal influences on foal behavioural stress responses during artificial weaning. Maternal foal-directed licking within the first hour post-partum of an initial 11 mares was recorded via CCTV footage across three studs with consistent management (*ad libitum* hay pre- and post-partum; human assistance during parturition). Mares varied in age (7-20 years), parity (eight multiparous, three primiparous mares), and breed (six Thoroughbreds, five Warmbloods). Foals' responses (time spent locomoting and number of vocalisations) to artificial weaning (at 4-6 months of age) were live-recorded for four hours following dam-offspring separation (achieved through progressive pasture weaning in all but one stud, where foals experienced abrupt pasture weaning; controlled for statistically). Locomotion behaviour of foals was assessed by instantaneous sampling every 10min, while maternal licking and foal vocalisations were assessed by *ad hoc* focal and continuous recording. There was considerable variation in the amount of maternal licking experienced by foals (M=73.45$\pm$12.37 SEM). At weaning, there was also high variation in the amount of vocalising (108.73$\pm$38.75) and time spent locomoting (37.27$\pm$9.35) performed by foals. Foals who received more maternal licking perinatally vocalised less following separation from their dams ($F_{1,5}$=24.377, p=0.004). These foals also engaged in less locomotion following weaning (r_s(9)=0.945, p<0.001), although this was not predicted by maternal licking. These findings suggest that foal behavioural stress responses during artificial weaning are modulated by the level of maternal behaviour received shortly after birth. We are currently analysing data from an additional 30 mares to increase statistical power and test for effects of mare parity, age, and breed. Future work will identify strategies to promote post-partum maternal licking and therefore lead to improved foal welfare at weaning.

Lay person message: Weaning is a stressful event for foals that can lead to abnormal behaviour and gut dysfunction later in life, negatively impacting foal quality of life long-term. Early life events, such as amount of licking received from their mothers, can modulate foals' adult stress responses. We found that foals who receive more licking showed fewer stress-related behaviours - restless walking, whinnying - at weaning. These preliminary results can now inform interventions to encourage maternal behaviour.

Keywords: horse; foal; welfare; weaning; maternal behaviour

LT9

POTENTIAL BEHAVIOURAL INDICATORS OF AFFECTIVE STATE IN STABLED HORSES

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Current research into equine welfare has demonstrated the need for reliable objective behavioural indicators of affective state, however, has yielded mixed results regarding behaviours suited for industry use and are open to subjectivity. Ten horses of varying breed, sex, age and exercise intensity were filmed using CCTV footage on either a day or night-stabling schedule over three consecutive days, with behavioural observations divided into blocks for time sampling of behaviours and collated in MS EXCEL using a pre-constructed ethogram. Sample blocks consisted of ten minutes on entry and prior to exiting the stable, with a randomly sampled ten minutes per each hour in confinement. Differences in the occurrence of behaviours between day-stabled and night-stabled horses were compared using a series of unpaired t-tests. Results showed that horses kept on a night-stabling routine were kept confined for significantly longer (13.6 ± 0.044) by owners than horses in the day-stabled regime (7.7.3 ± 0.069; t_7 = 5.7; P = 0.0004) and only 11 of the 52 recorded behaviours displayed a significant increase in frequency for horses in the night-stabled regime compared to day-stabled horses. Night-stabled horses were significantly more likely to have increased variation in ear positioning (forward ears, t_7 = 3.315; P = 0.01, neutral ears, t_7 = 3.469; P = 0.01, ears positioned one forward/back, t_7 = 4.069; P = 0.005), as well as displaying more frequent locomotory behaviours (stepping forward, t_7 = 2.621; P = 0.03, lateral stepping, t_7 = 2.397; P =0.04) and sternal recumbency (facing sideways, t_7 = 2.640; P = 0.03). Other behaviours that showed a significant increase in frequency for night-stabled horses include yawning (t_7 = 2.692; P = 0.03), non-nutritive chewing (t_7 = 2.491; P = 0.04), non-locomotory leg movement (t_7 = 5.333; P = 0.001) and closing eyes (t_7 = 2.710; P = 0.03). These behaviours were then investigated in the literature for links to affective state in both horses and other large animal species. Behaviours such as non-locomotory and locomotory leg movements are linked to stress in dairy cattle and may have the potential to indicate early stages of barrier frustration in horses, whilst sternal recumbency shows a link with increased environmental comfort. With further validation and study, behavioural indicators may improve equine quality of life through more accurate identification of affective state and allow for optimisation of housing and husbandry practices.

Lay person message: Reliable behavioural indicators are needed to accurately assess horse welfare and to gain insight into equine affective states. A comparison of the behaviour exhibited by horses stabled on a day or night turnout rotation highlighted behaviours such as frequent ear movements, non-locomotory leg movements and sternal recumbency as potential indicators of affective state in accordance with the current literature and may assist with providing insight into a horse's perception of its housing and management.

Keywords: welfare; affective state; quality of life; stabling; behaviour; ethogram

LT10

DIFFERENCES IN CONFLICT BEHAVIOURS IN RIDDEN EQUIDS WEARING BITTED OR BITLESS BRIDLES WHILE UNDERTAKING HALT TRIALS

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The advent of the bitless bridle in contemporary media is well-known, however appearance in published literature is limited. Anecdotally, their popularity has risen, with demands for acceptance in British Dressage. Previous bitless bridle research studied effects on naïve unbroken equids, use in equine assisted therapy and comparison with bitted bridles. This study investigated conflict behaviours (CB) in halt trials with horses ridden in a bitted bridle or a Dr Cook© bitless bridle. College horses (n=10) were ridden in 24 halt trials each, with three trials in each bridle at walk and trot (12 trials) and on left and right reins (12 trials) ending in halt within a set of cones 2m apart in a 20x40m arena. Horses were ridden by the same rider in their own bitted bridle or a Dr Cook© bitless bridle chosen by random crossover selection. Bitted bridles used cavesson nosebands measured with the International Society for Equitation Science Taper Gauge. An ethogram of CB tested in a pilot trial were tallied in real time and by video recording by two observers (a qualified behaviour consultant and an Equine Science graduate). Disguising of bridles was attempted in the pilot however it caused stress in the subjects, so the method was not used. Behaviours recorded were Head Toss (HT), Mouth Open (MO), Pull Down (PD) and Raise Head (RH). Data were processed through MiniTab18© using Mann Whitney tests. There was no significant difference in count of behaviours between bitted and bitless bridles against all measures ($F=1.60$, $p=0.253$). However, there were significant differences in two separate CB, where horses wearing the bitless bridle exhibited significantly more RH ($F=24.05$, $d.f.=1$, $p=0.003$), and horses wearing the bitted bridle exhibited significantly more OM ($F=75.6$, $d.f.=1$, $p=0.000$). These results suggest horses exhibit different CB depending on type of bridle worn, possibly due to variation in positioning of pressure when halting. Lack of research investigating how bitless bridles act on facial anatomy might delay their acceptance until there is comparable evidence with the causes of CB in bitted bridles.

Lay person message: Bitless bridles have increased in popularity, with calls for them to be adopted in official disciplines. Equal counts of conflict behaviours were found with both bridles; however, they were different. Horses wearing bitless bridles exhibited significantly more head raising behaviours than those in bitted bridles, who displayed more open mouth behaviours. More research is needed to determine how bitless bridles act on facial anatomy.

Keywords: conflict behaviour; bitless bridle; bitted bridle; halt trials; open mouth; raised head

LT11

RIDER ASSESSMENT OF SADDLE POSITION

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Recent research has highlighted the detrimental impact of an ill fitting saddle on the health, welfare and performance of horses. Suboptimal saddle fit can negatively impact horse welfare, leading to a decrease in performance largely attributable to pain particularly in the thoracolumbar region. For the saddle to be correctly positioned, the front of the saddle tree points should be approximately 4-5cm (1½-2 inches) behind the caudal proximal aspect of the horse's scapula, with the length of the tree not extending beyond the last rib. It is regularly reported that many saddles are placed too far forward. However, there is a lack of evidence to support this statement as the majority of research has focused on the fit of a saddle rather than its placement on the horse's back. The aim of this study was to investigate rider ability to assess saddle position. A short survey (10 minutes maximum completion time) comprising open and closed questions on rider demographics, their equestrian activities and attitudes and experience around saddle fitting, was distributed via snowball sampling on social media. Respondents were also required to visually assess twelve side on photographs of horses wearing saddles to determine whether the saddles were in the correct or incorrect (too far forward or too far back) position. The participant group (n=401) represented all ages (18 to >85 years old), with varying years of experience, and competitive (53.49%) and non-competitive (46.51%) involvement in a range of equestrian disciplines. The majority were pleasure riders (28.38%) or dressage riders (23.04%). Less than 60% of participants correctly identified the position of the saddles. Rider age, years of experience riding and riding discipline was not assocated with ability to correctly assess saddle postion (all ANOVAs $p>0.05$). However, participants who have previously had their own saddle fitted professionally were better able to correctly assess saddle position (professional fitted: 60.8±19.0 %correct compared to not professional fitted: 52.2±19.0; $t_{315}=3.67$; $P<0.001$). Participants who are unable to correctly position the horse's saddle increase the risk of causing the horse uncessary discomfort and pain. Given the emerging focus on animal-based indicators of welfare, and the fact that a horse cannot escape an incorrectly positioned saddle, riders should be provided with education to enable them to improve the welfare of the horse.

Lay person message: Correct positioning of the saddle on the horse's back is an important part of saddle fitting. A correctly fitting saddle placed in the incorrect position is likely to have a detrimental effect on the horse's health and performance. Given nearly half of the participants surveyed failed to identify the correct saddle position there is clearly a need for further education in this important aspect of saddle fitting to safeguard the horse's back health and consequently welfare.

Keywords: horse; saddle; position; welfare; survey; rider

LT12

GETTING A GRIP: A POTENTIAL RIDER IMPACT?

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Objective measurement of the impacts of riders is critical to the consideration of ethical and sustainable horse use. There is limited scientific examination of the impact of human physical attributes on the ridden horse in particular. Grip strength is a measure of the muscular strength (maximum force/tension) generated by one's forearm muscles and applied to the object being held. It is a component of hand strength that can be objectively assessed by measuring the force applied to grasp, pull on or suspend from an object. Equestrians regularly use crush grip (reins held between the fingers and palm) and pinch grip (reins held between the fingers and thumb). Effective horse training relies on both providing cues (applying pressure) and reinforcing desired behaviours (via the release of pressure). This pressure is applied and/or released in part by the rider's hands via the reins and should be done in a contiguous and consistent manner. Sport scientists have shown that greater use of the dominant hand results in enhanced muscular recruitment compared to the non-dominant hand. This is compounded by the increased likelihood of a better perception of grip strength of the dominant hand. Not surprisingly rider handedness has been linked with uneven holding of the reins, which can impact the 'sidedness' exhibited by the horse. A rider/handler's grip strength may influence their ability to provide consistent and precise cues. This difference in strength between left and right-hand cues may lead to inconsistent reinforcement of the horse and consequently cause confusion. The aim of this study was to compare equestrians' left- and right-hand grip strength. The grip strength (kg) of 70 subjects' left and right hands were measured simultaneously (3 replicates per subject) using a pair of digital dynanometers. Subjects (n=63 females, 7 males; mean age 25±9.54 years; height 169.3±8.91 cm and weight 68.6±12.79kg) represented a range of riding experience levels and riding disciplines. Fifty-six (80%) were right-handed and the remaining 14 (20%) were left-handed. Right hand grip strength was significantly greater (28.4±8.42 kg) than left hand grip strength (27.4±8.87 kg; t_{69}=-3.66; $p<0.001$). Hand dominance did not determine which hand was stronger at an individual subject level. Therefore, any influence of rider handedness on the horse is more complex than mere grip strength. This study demonstrates that objective measurement of immediate and long-term impacts of riders on horses is necessary to avoid assumptions that may compromise horse welfare, ultimately impacting on quality of life.

Lay person message: It is becoming increasingly important to understand the impacts that riders have on horses. Rider grip strength can influence how tightly reins are held and negatively impact the horse, especially if one of the rider's hands is stronger than the other. This complex interplay can negatively affect the horse due to causing confusion and/or discomfort. This is concerning because possible longer-term effects such as one-sidedness and behavioural problems will compromise the horse's quality of life.

Keywords: grip strength; horse; rider handedness; rein; welfare; laterality

LT13

WHEN TECHNOLOGY MAY NOT TRANSLATE: ARE HUMAN PEDOMETERS ON HORSES A STEP TOO FAR?

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Technology has become a core part of Equitation Science research. Human-based measuring equipment is being applied to horses to secure animal-based indicators of welfare, however this equipment is only as good as the validation processes applied to assess its accuracy and reliability. Not surprisingly given their availability and relative affordability, pedometers designed to measure steps taken by humans (bipeds) have been applied to horses (quadrupeds). The simplest way to determine the accuracy of pedometer data is to compare the step-count to the actual number of steps taken. The aim of this study was to determine first, the accuracy of two common types of pedometer when fitted to a horse in walk and trot, and second, the effect of pedometer position. Five fit and sound geldings (7-14 years) were fitted with spring-lever and piezoelectric pedometers on the left and right forelegs and scapulae, and chest, and walked and trotted in-hand on a 20m circle 10 times on each rein. Simultaneous video recordings were obtained using a camera on the centre of the girth facing the horse's forefeet. The deviation of the number of steps recorded from the actual number of steps taken was derived for analysis. Percentage errors for both pedometer type failed to meet the accuracy requirements for use in humans when fitted to horses (<5%). All pedometer recordings differed significantly from the actual number of steps taken (H_1=26.23; p<.0001) and was influenced by pedometer type and positioning (H_1=340.31; p<0.001). In walk, piezoelectric pedometers underestimated steps taken when fitted to the forelegs, and overestimated steps taken when fitted centrally (chest) or on the scapulae. However, in trot steps taken were underestimated in all positions (all sign U, p<0.01). In walk, spring-lever pedometers overestimated steps taken when fitted to the forelegs, and underestimated steps taken when fitted centrally (all p<0.001) but appeared accurate when fitted to the scapulae (p>0.05). Similar position effects were seen in trot (forelegs overestimated, central underestimated steps taken), but the accuracy observed in walk when fitted to the scapulae was lost in trot with overestimation of steps taken depending on which diagonal the horse was working on (all sign U, p<0.001). Furthermore, piezoelectric pedometer recordings were most significantly impacted by gait whilst spring-lever recordings were most significantly impacted by individual horse (all F, p<0.0001). Human pedometers do not generate accurate or useful information for horses and are therefore an ineffective tool for measurements of activity that could contribute to assessment of horse welfare.

Lay person message: There is increasing interest in using technology such as pedometers to assess how the horse is working. Research has shown that there is little value in using pedometers designed for humans on horses as the information obtained is inaccurate and subject to many influences such as pedometer type and position, horse gait and individual horse characteristics. Inaccurate information is likely to be detrimental to assessment of horse welfare and ultimately quality of life.

Keywords: equine; pedometer; piezoelectric; spring lever arm; indicator; welfare

LT14

THE EFFECT OF THREE-LEGGED WEIGHT BEARING STANCE ON THE ACTIVITY OF THE RECTUS ABDOMINUS MUSCLE

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The importance of rehabilitation post veterinary diagnosis of an equine musculoskeletal injury is becoming a vital component of recovery. Objective evidence of success in the application of specific rehabilitation exercises and equipment is increasing, enabling the development of safe and effective rehabilitation programs that promote positive equine quality of life. Balance exercises such as standing on one leg is commonly utilised in humans to assess and improve postural and core stability. A potential exercise to enhance core stability involves standing the horse on three legs increasing the weight bearing load and challenging the horse's overall stability. The core musculature comprises epaxial and hypaxial muscles such as the abdominal muscles, the *transverse abdominus*, *internal abdominal oblique*, *external abdominal oblique* and the *rectus abdominus*. The *rectus abdominus* is the most studied of these and is involved in dorsiflexion of the thoracic and lumbar spine and hence implicated in core stability**.** The aim of this study was to compare the activity of the *rectus abdominus* muscle when standing on a hard surface with all limbs weight bearing compared to three-legged weight bearing with a forelimb held up in a comfortable non-weight bearing position. The electrical activity of the *rectus abdominus* was obtained using tri-axial Delsys surface electromyography (sEMG) sensors. An observational study was conducted with eight horses, the sEMG sensors were placed lateral to the umbilicus on a flat area of the *rectus abdominus* bilaterally. Each horse stood on a concrete surface with a handler at the front of the horse for 60 seconds. This was repeated three times with a two-three minute break in between each repetition for three days. The following week the same eight horses were stood in the crush in the same manner with the left and then the right foreleg held in a comfortable non-weight bearing position as described and observed on three consecutive days. iEMG software compared estimated muscle workload to experimental conditions with a baseline obtained in full weight bearing. Whilst descriptively there was a decrease in three-legged stance relative to the baseline on a cohort basis, a series of Wilcoxon signed-rank tests revealed no significant differences ($p>0.05$) in the mean left or right *rectus abdominus* muscle activity between full weight bearing and three-legged weight bearing conditions. This is not surprising considering the wide degree of variation evident between and within horses. There is potential for examining the effects of interventions challenging postural stability on core stability such as Sure Foot™ pads on an individual horse level.

Lay person message: Rehabilitation of musculoskeletal injuries commonly involves exercises to improve core stability. The *rectus abdominus* - a core abdominal muscle may be activated in equine balance exercises. Whilst it has been suggested that exercises such as standing on three legs may improve equine core stability, this study did not reveal an increase in *rectus abdominus* activity with three-legged weight bearing warranting at a group level, and has yet to assess effects at an individual level and the effect of interventions.

Keywords: core stability; posture; balance training; rehabilitation; electromyography

DAY 2 THEME 2: TOOLS FOR CHANGE

PL2

ANALYSING THE RIDER IN MOTION: CHALLENGES, PERSPECTIVES AND POTENTIAL IMPACTS ON EQUINE QUALITY OF LIFE

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Advances in technology have elicited many opportunities to analyse the rider in motion, whether on a horse or a riding simulator. Optical motion capture cameras can track the rider's movements with high precision, resulting in large amounts of data that can be analysed in a myriad of ways. Many scientific studies have sought to understand the key factors that influence the rider's ascent to elite competition, particularly in dressage. Specifically, many analyses have focussed on a measure of horse-rider harmony. This measure describes the ability of the rider to match the horse's movement. Previous analyses have focussed on comparing elite and novice riders and measuring harmony at a single point in the horse's stride. However, these methods have the potential to miss important insights about the rider for several reasons: elite riders may have their own unique strategies to achieve harmony that would be overlooked in a group analysis; and measuring harmony at only one point within the stride disregards the effect of the horse's movement on harmony during the entire gait cycle.

Accurate measures of harmony have the potential to influence equine quality of life as dissonance between horse and rider could impact the horse's musculoskeletal health or elicit conflict behaviours. Once the factors that relate to high levels of horse-rider harmony are known, they can be taught to riders early in the learning process to limit horse-rider dissonance. The greatest challenges to quantitatively defining harmony to meet this goal are related to the data collection process and the subsequent data analysis. In particular, standardising the horse variable to assess the rider in isolation is fraught with difficulty, although using a riding simulator may provide some indication of the rider's strategy. In addition, assessing harmony over the entire gait cycle, rather than at a discrete instance, requires processing using a computer coding language (e.g. MATLAB).
Over the course of four experimental studies, a protocol was developed to measure simulator-rider harmony. In all, forty female competitive (British Dressage and FEI) dressage riders volunteered for the studies. Each were measured using optical motion capture cameras with full-body reflective markers, on the riding simulator in simulated walk, trot and canter. Data from subsets of this larger population and specific gaits were used to meet the aims of each study. The studies aimed to: 1) to assess the influence of competition level and static assessment of the rider's pelvic posture on dynamic pelvic tilt in simulated walk, trot and canter; 2) to elucidate the simulator-rider coordination variability in medium and extended trot over the full movement cycle in the rider's head, trunk, pelvis and foot; 3) to understand the patterns of simulator-pelvis coordination in medium and extended trot; 4) to use machine learning to ascertain whether riders could be grouped by their trunk-pelvis movement strategy in medium trot.

On the whole, lack of significant differences between low-level and elite (FEI) level dressage riders in any measure suggest that classifications other than competition level should be used when assessing the rider's biomechanics during simulated riding. Further, interesting insights regarding the rider's independent seat can be gained by analysing the coordination variability between multiple rider segments to the riding simulator. In medium trot, riders allowed significantly (p <0.05) greater

simulator-trunk coordination variability than simulator-pelvis, but in extended trot, simulator-trunk coordination variability significantly (p <0.05) decreased. This indicates that riders must initiate a more consistent coordination with their trunk to the riding simulator in extended trot to conserve the consistency of their seat. Analysis of the shape of the simulator-pelvis continuous relative phase (coordination pattern) using principal component analysis in medium and extended trot revealed that riders, regardless of competition level, closely couple the pitch rotation of their pelvis to the vertical displacement of the riding simulator, but a variety of coordination patterns exist. Finally, artificial neural networks may be used to identify clusters of rider trunk and pelvis strategies that relate to the relationship between the timing of the maximal trunk and pelvis pitch within a movement cycle.

Taken together, these results suggest that riders, particularly elite riders, should be analysed during riding or simulated riding, rather than statically, and the entire movement cycle should be analysed using appropriate techniques. These techniques, including the measure of harmony using the continuous relative phase, analysis of entire waveforms using statistical parametric mapping and principal component analysis, and classifying using artificial neural networks could be applied to the live horse setting. These methods could also be extended to analyse other factors, such as rein tension, force patterns, or equine gait, as these measurements constitute continuous data gathered over a movement cycle. Therefore, while the results of these studies pertain to the riding simulator, the methods may open the door to further studies that may significantly improve the ridden horse's quality of life through the discovery of factors that influence harmony, or by discovering patterns in the data that relate to factors of interest.

Lay person message: There are a growing number of studies that analyse horse-rider coordination. Harmony is an important factor in dressage competition, but also relates to horse quality of life in training. These studies present several ways to analyse harmony initiated by the rider. No measurement was related to competition level. However, the characteristics of simulator-rider harmony (e.g. the 'independent seat') and new clusters of rider pelvis-trunk movement were identified.

Keywords: equestrian; biomechanics; kinematics; harmony; coordination; continuous relative phase

RP6

CO-OPERATIVE CARE PROTOCOL USING PROTECTED CONTACT AND POSITIVE REINFORCEMENT TO FACILITATE SIMULATED VETERINARY INTRA-MUSCULAR INJECTIONS IN HORSES

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Routine procedures result in a high number of significant, potentially career limiting, injuries to equine veterinarians, 10% of which occur when using a needle. Co-operative care involves training the animal using positive reinforcement, to give consent and willingly participate in a procedure, with the animal afforded the choice to co-operate or not, by being free to move within an enclosure behind a barrier and without restraints, known as protected contact. Marine, zoo, and laboratory animal centres routinely use co-operative care protocols to reduce human injury and fatalities and improve animal welfare during aversive procedures. Despite injury risk being high in equine veterinarians, a similar protocol for horses does not exist. The aim of this study was to determine whether there were significant differences between physiological and behavioural parameters between simulated conventional (CONV) and protected contact positive reinforcement (PCPR) vaccination methods, and to devise a standard protocol for a co-operative care vaccination procedure. Initial behavioural data was collected from veterinary vaccinations. Behaviour scores were calculated using an ethogram to count frequencies of behaviours (calm, frustration, anxiety, avoidance, fear, aggression, and pain/discomfort categories). Eight horses were subjected to a simulated conventional intra-muscular injection, followed by two weeks of training three times a week for one ten-minute session, then a simulated intra-muscular injection using the trained co-operative care protocol. Heart rate (HR), heart rate variability (low frequency to high frequency power ratio (LF/HF), standard deviation of normal-to-normal intervals (SDNN) and root mean square of successive RR differences (RMSSD)), eye temperature (ET) and behavioural data were collected for both simulations. Seven out of eight horses completed the training. The number of sessions to acquisition was between four and seven. There were no significant changes in HR, ET, and LF/HF ratio. SDNN (paired t-test = 66.66± 9.03, 85.89±18.81 ms, $P<0.05$) and RMSSD (paired t-test = 63.81±15.62, 82.61±17.08 ms, $P<0.01$) were significantly higher during the PCPR procedure. There was a significant positive correlation between CONV RMSSD (Pearson Correlation = r_4, .91, $P=0.01$) and the horse's age and number of previous vaccinations. Behaviour scores were significantly higher in the veterinary procedure (paired t-test = 3.39±0.57, 0.77±0.23, $P<0.001$) and CONV (paired t-test = 1.58±0.41, 0.77±0.23, $P<0.01$) compared to PCPR. The potential to improve equine welfare and veterinarian safety by using co-operative care protocols warrants further investigation in actual veterinary procedures to bring the equine industry in line with more welfare appropriate protocols already successfully used in other species.

Lay person message: Routine procedures result in a high number of significant injuries to equine veterinarians. Co-operative care training with positive reinforcement allows horses to consent to a veterinary procedure by exercising choice to participate as the horse is not restrained and is behind a barrier known as protected contact. The use of co-operative care protocols in the equine industry has the potential to improve equine welfare and veterinarian safety in line with successful use in other species.

Keywords: co-operative care; injection; positive reinforcement; protected contact; veterinary procedure

RP7

DO PHYSIOLOGICAL PARAMETERS REFLECT STRESS IN HORSES WHILE BEING LED THROUGH AN OBSTACLE COURSE?

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Physiological parameters, such as heart rate (HR), heart rate variability as expressed by the root mean square of successive differences between heartbeats (RMSSD) and salivary cortisol, are potential indicators of stress in horses. This study measured physiological parameters in horses while being led through an obstacle course involving minimal physical activity (walking pace). In total 28 horses (15 mares and 13 geldings) were used with an average height of 154±12 cm and average age of 10,6±6.0 years. The obstacle course consisted of three novel objects; a large arch with ribbons attached, two rows of colourful flags and umbrellas, and a blue plastic cover. A Polar H10 heart rate sensor transmitter was used in combination with a Polar M430 receiver and Hylofit electrodes after wetting the fur and applying Aquasonic 100 conducting gel. Heart rate and heart rate variability were measured in the stable (baseline) and during the obstacle course. Kubios software was used to analyse parameters of heart rate variability and the strong filter was applied to the raw data to reduce artefacts. Saliva samples were taken in the stable (baseline) and directly after the obstacle course using Salivabio swabs. The effect of level of performance was also analysed: based on their performance level during the obstacle course, horses were assigned to 3 groups (fast, medium and slow performers). The 'fast' group had a total duration of the obstacle course between 120 and 300 seconds (N= 12), the 'intermediate' group between 300 and 500 seconds (N=7) and the slow group took more than 500 seconds (N=9). Results demonstrate that the average HR was significantly higher during the obstacle course compared to the baseline, whereas the RMSSD was significantly lower compared to baseline (Repeated measures; d.f. 1; p=0.000, p= 0.001 respectively). No significant effect of performance level was found for HR, SDNN and RMSSD (Repeated measures; d.f.2; p= 0.366, p= 0.281, p=0.492 respectively). This indicates that novel objects can be stressful for horses even when they seem to perform well. Furthermore, for salivary cortisol no significant difference between the baseline and obstacle course was found (Repeated measures; d.f.2; p=0.357) and no significant effect of performance was found (Repeated measures; d.f.2; p=0.708). In conclusion, HR and HRV may be used as physiological parameters of stress in horses.

Lay person message: Heart rate and heart rate variability might be a good parameter for measuring stress and the Polar heart rate monitoring system is practically feasible and can be used during equestrian practice to measure stress. An obstacle course with novel objects is a potential source of stress even when horses perform well.

Keywords: stress; obstacle course, heart rate, heart rate variability, salivary cortisol

RP8

WHY THE LONG FACE? HORSES SHOW DISTINCT FACIAL EXPRESSIONS DURING AGONISTIC AND AFFILIATIVE INTERACTIONS

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Horses are social animals forming strong, long-lasting bonds within social groups and can perform a variety of facial movements i.e. nostril dilation and ear movements. The development of the Equine Facial Action Coding System (EquiFACS) presents the opportunity to analyse equine facial movement variation in different situations. Horses recognise and react to facial expression in photographs of unknown conspecifics. The present study used interactions during routine turnout in same-gender groups, focusing on facial expressions during agonistic and affiliative interactions. Data were collected between September 2020 and December 2020 using riding school horses (n=37) at Sparsholt Equine Centre (UK) (24 geldings: 13 mares). Due to sampling being opportunistic, the number of interaction recordings varied between subjects. Experimenters engaged in 30-minute focal watches of selected horses. A camera (Panasonic HC-VXF1) focused on the subject's face recorded horse-horse interactions when they occurred, finishing when the subject's face returned to a neutral position for a minimum of five seconds, or a new behaviour was exhibited. A GoPro Hero 5 filmed the focal horse and immediate surroundings. Opportunistic recordings of interactions and neutral facial expressions of nearby subjects were conducted when the focal subject was inactive to aid future analysis. The EquiFACS manual was used to code facial movements; 300 interactions were coded, 178 agonistic and 122 affiliative. A chi-squared goodness-of-fit test identified significant differences between facial movements in agonistic and affiliative interactions. If areas of the face were not visible, any relevant facial movements were marked as absent. Facial movements most significantly linked with affiliative interactions were blink (N=64, DF=1, X^2=10.9280, P=0.001) and ears forward (N=39, DF=1, X^2=23.4851, P<0.001). For agonistic interactions, the most significant facial movements were nostril lift (N=18, DF=1, X^2=10.5812, P=0.001), ear flattener (N=125, DF=1, X^2=50.6800, P<0.001), ear rotator (N=152, DF=1, X^2=18.4111, P<0.001), and nostril dilator (N=50, DF=1, X^2=11.3004, P=0.001). Increased blink rates were strongly associated with positive interactions, supporting research suggesting blink rates decrease while experiencing pain or emotional stress. Nostril lift was seen almost exclusively during agonistic interactions. Nostril dilator was observed most often in agonistic interactions, supporting previous work suggesting nostril dilation is linked to negative emotion. These results support anecdotal interpretations of facial expression and may be used to study social interactions in horses and better interpret these expressions during routine management tasks. Future research aims to identify how facial movements combine to produce discrete facial expressions in specific contexts, furthering our understanding of equine communication.

Lay person message: Horses respond to facial expressions of other horses, however measuring this has improved since the development of the Equine Facial Action Coding System (EquiFACS). Blinking and ears forward were associated with friendly interactions, ears flattened and nostril dilation with unfriendly ones. This supports common knowledge but may improve research into equine interactions and interpretation of facial expressions in daily management.

Keywords: EquiFACS; facial expression; communication; agonistic; affiliative

RP9

DEVELOPMENT OF A CHRONIC PAIN MONITORING INSTRUMENT FOR OWNER RECOGNITION OF OSTEOARTHRITIS PAIN IN HORSES THROUGH BEHAVIORAL INDICATORS

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Osteoarthritis is a major cause of chronic pain in horses, but is an under-recognised and undertreated condition, partly because many horse owners are unaware of the behavioural signs of chronic pain in their horses and so fail to seek advice from a veterinarian. At the same time, small animal clinicians have found owner assessment of their pet's behaviour to be a clinically useful tool in managing pain treatment and therapy efficacy, as well as in making quality of life decisions. Therefore, the objective of this study was to provide horse caregivers with an objective, easy-to-use questionnaire to help them to systematically recognise and monitor behavioural signs of chronic pain in their animals. The instrument has been through the initial steps of development and psychometric testing, including initial item selection by means of literature review, focus group discussions, and expert panel review. The expert panel consisted of nine veterinarians and/or PhDs with specialties in orthopedics, anesthesia and analgesia, equine geriatric medicine, animal behavior and zoological medicine, osteoarthritis and equine joints, animal welfare science, equine surgery and orthopedics, biomechanics, veterinary educational research, and clinical orthopedics and lameness. The draft created through that process included items on posture, facial expression, movement, and behaviour as well as summary items on the perceived current level of pain, changes in pain level, and quality of life. The document was then tested for readability and found to be understandable for horse owners age 12 years and older. The 15-item questionnaire was next tested for usefulness and clarity in a group of 25 horse owners (16 amateurs, 9 professionals, 23 women and 2 men) with horses with veterinarian-diagnosed osteoarthritis and who participated in a variety of disciplines, including dressage, pleasure riding, various forms of groundwork, different types of Western riding, show jumping, carriage driving, and eventing. Twenty-two participants found the instrument useful and an additional 2 people thought it would be useful for "less experienced people". All participants could complete the instrument in 5 minutes or less. Cronbach's alpha, a measure of the internal consistency of test items, was .957. The questionnaire is now being validated for reliability in a convenience sample of 60 owners of horses with veterinarian-diagnosed osteoarthritis. The reliability testing involves asking owners or caregivers to complete the questionnaire twice with a two-day interval between the observations.

Lay person message: Arthritis is a major cause of chronic pain in horses, but many horse owners may not recognise how their horses express pain. A short, 15-item questionnaire for monitoring chronic arthritic pain has been developed that asks owners to give a numerical score to elements of their horse's posture, facial expression, movement, and behaviour for comparison over time. In a pilot study of 25 people with horses diagnosed with arthritis, the questionnaire was found to be useful.

Keywords: osteoarthritis; equine chronic pain; pain scale validation; equine behaviour; caregiver assessment

RP10

PERSONALITY IN HORSES: ASSESSING HORSE PERSONALITY AND SIMLARILTY BETWEEN OWNER HORSE PAIRS PERSONALITY TRAITS

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The personality of a horse is thought to influence horse-human relationship and will have a large impact on the horse's welfare as well as the suitability to certain disciplines. Agroscope focused on improving existing methods to assess personality. Firstly, we developed a new questionnaire, working with 55 items, as sentences, describing specific behaviors, instead of single adjectives. Secondly, because some horses have the propensity to display no visible stress reactions, we developed three new personality tests in order to improve the assessment of the relationship between behavior and underlying stress. With the aim to get a representative sample to validate our questionnaire and to investigate, which personality components are similar between horse and owner, 2432 horse owners completed an online survey by filling in our horse's personality questionnaire for their own horse, after assessing their own personality traits based on the Big Five inventory. Out of this sample, 39 horses were additionally tested in personality tests (5 validated personality tests and the 3 new personality tests) carried out by 2 experimenters, in order to monitor the owners' responses to the questionnaires. We then compared the results of the equine questionnaire to the results of the personality tests and investigated which components of the equine personality versus owner personality were similar. A principal component analyses run on the equine personality questionnaire identified 4 factors (i.e. Emotional stability ("E"), Conscientiousness ("C"), Agreeableness with human and Agreeableness with horses) related to human personality. Personality scores obtained from the questionnaire showed, first, that owners with a higher E score perceived their horses to be also easily stressed ($rs = 0.26$, $N = 2432$, $p < 0.05$). Personality tests carried out on the 40 horses confirmed the personality scores obtained by questionnaire for this trait. Indeed, horses described as being easily stressed were much more active during personality tests ($rs = 0.56$, $N = 40$, $p < 0.05$). Second, we were able to show that conscientious owners described their horses as more conscientious as well ($rs = 0.26$, $N = 2432$, $p < 0.05$). Regarding the 3 new personality tests, preliminary ongoing analyses looked at finding new indicators of stress to better identify arousal in horses. In conclusion, a similarity between horses and owners for the personality traits "emotional stability" and "conscientiousness" seems to exist. In addition, we expect some behaviours to be specifically indicating stress in horses displaying no clear reaction to stress.

Lay person message: A similarity between horses and owners for the personality traits "emotional stability" and "conscientiousness" seems to exist. Moreover, we expect with our ongoing analyses to find new indicators of stress and to find a new test in order to better identify passive horses, displaying no visible stress reactions, who were ignored for a long time, as they were not recognized as stressed. This work aims at providing a better understanding between humans and horses.

Keywords: personality; matching personality; Big Five; questionnaires; personality tests; stress

K2

ASSESSING SELF-CONTROL ABILITIES IN HORSES WITH A DELAY OF GRATIFICATION PARADIGM

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Self-control is defined as the capacity to forgo an immediately available, less valuable outcome in favour of a more valuable but delayed outcome. Being able to inhibit highly motivated behaviours is of advantage for horses in several situations, such as training or handling, but might also be linked to obesity or coping capacities. Horses encounter situations that require self-control on a daily basis. For example, horses should refrain from eating grass while riding or need to inhibit the urge to flee in a frightening situation. In other species, it has been shown that self-control is involved not only in general intelligence but also related to trainability, learning performance, and aggression. The aims of the current study were two-fold: firstly, we wanted to assess horses' self-control abilities, and secondly, we were interested in finding out whether housing conditions or body condition explained individual differences in self-control.

We tested 31 privately owned horses (16 female/15 male) of various breeds in a delay of gratification paradigm. To detect individual food preferences, we conducted a food-choice test. After procedural training, horses were presented with a choice between an immediately available low-quality reward (LQR; hay) and a high-quality reward (HQR; e.g. apple, carrot, banana) that was made available only after a delay, if the horse refrained from consuming the LQR. The delay between reward options was increased in a stepwise manner up to 60s depending on individual success in the previous session. After having completed an initial training to ensure reliability, multiple experimenters (N = 16; 1-2 familiar and 0-1 unfamiliar horses per experimenter) conducted the experiment. Additionally, background information on the horses (age, sex, breed, height, weight) and their housing conditions (individual or group housing, hay feeding regime) was collected.

The horses waited for 37.81±23.05s (mean±SD) to receive HQRs (range: 0s–60s) with 45% of horses reaching the maximum delay duration of 60s. Waiting success decreased with increasing delay duration (GLMM: -0.15±0.03, $z=-5.86$, $p<0.001$). Older horses showed better self-control compared to younger horses (CLMM: 0.01±0.01, $z=2.56$, $p=0.011$). Neither sex (CLMM: 0.56±0.83, $z=0.67$, $p=0.502$) nor body condition (weight-height ratio: 1.21-4.14; CLMM: 0.92±1.06, $z=0.88$, $p=0.381$) affected individual success. Furthermore, we found no effects of experimenter familiarity (familiar (N=20)/unfamiliar (N=11): CLMM: -1.19±1.33, $z=-0.90$, $p=0.367$), housing conditions (individual (N=14) vs. group-housing (N=17); CLMM: 1.81±1.93, $z=0.94$, $p=0.348$) or hay feeding regime (restricted (N=19) vs. ad libitum (N=12); CLMM: -1.19±1.39, $z=-0.86$, $p=0.392$) on self-control abilities. We found great individual variation in distraction behaviours shown during the waiting period (e.g., locomotion, chewing, manipulating objects, including actively trying to push the LQR away). In particular the latter distraction behaviour suggests that horses were challenged by the task and actively tried to reduce their stress due to the conflict between their motivations to consume an immediately available LQR as opposed to the only later available HQR.

These results show that horses are able to tolerate relatively high delays compared to other species; even though, due to the design of our present study we were not able to assess horses' maximum delay capacities, and this is subject of follow-up study. Whether individual level of self-control as well as individual coping strategies to exert self-control are related to learning ability or behavioural

problems and how specific housing conditions or training practices affect self-control need to be addressed by future research with a larger sample size. Gaining insights into the influence of self-control on behaviours in various contexts (i.e. coping behaviours, trainability) is important to predict arising behavioural problems during training or in the stable. Furthermore, the option of improving self-control capacities with training poses an interesting future avenue. In addition, we need to assess whether self-control abilities are context-specific and whether other measures of inhibitory control, such as motor inhibition or cognitive inhibition, are related to self-control abilities.

Lay person message: Being able to inhibit highly motivated behaviours might be advantageous for horses in various situations, such as training or feeding. We presented horses with a choice between an immediately available, less preferred food reward and a more preferred but delayed food reward. We found that horses show great individual variation in self-control and some horses waited for up to 60s in order to gain access to the better food reward.

Keywords: delay of gratification; delayed reinforcement; self-control; cognition; behavioural inhibition; equine behaviour

LT15

RELATIONSHIP BETWEEN BEHAVIOUR ASSESSED DURING STALLION LICENSING AND LICENSING RESULTS

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Personality traits are of major importance to riders and breeders at all levels. Based on stallion licensing guidelines, personality should be part of stallion's evaluation during stallion licensing. However, with many Warmblood breeds, no particular personality or behaviour-related traits are scored during licensing. For example, in the case of Hanoverians, personality traits are only supposed to be part of the grade for "overall impression". The aim of the present study was to assess what, if any, objectively measurable behaviour shown during presentation of the stallions during licensing relate to licensing success (licenced/ not licenced; if licensed, with or without honours). Publicly available video recordings of 296 stallions presented during the years 2017-2019 at Hanoverian stallion licensing were used for video analysis. Observed licensing parts included: individual presentation in-hand at a halt, walk and trot, presentation at walk in a group, free-jumping and free-running. A total of 19 behaviour traits such as rearing, disregarding the handler's aids and restlessness during presentation at a halt were assessed for frequency or duration. The majority of assessed behaviour traits did not relate to licensing success. However, as expected, generalized linear mixed models revealed that show-jumping stallions completing free-jumping without faults had a significantly greater chance to be licensed (GLIMMIX: $F_{1,84}$=7.44; p= 0.0078). Stallions that showed restlessness for a greater proportion of the presentation time in hand tended to have a lower chance of being licensed (GLIMMIX: $F_{1,285}$=5.71; p= 0.0175). Additionally, there was a tendency for an interaction such that with dressage but not with show-jumping stallions, an increasing frequency of disregarding the presenter's aids lowered licensing success (GLIMMIX: $F_{2,284}$=2.50; p= 0.0841). In contrast, an increasing duration of tail posing during free-running tended to lower the chance to be licensed with honours in show-jumping but not dressage stallions (GLIMMIX: $F_{2,284}$=3.48; p = 0.0321). Results show that, although not explicitly evaluated, a few behaviour traits directly or indirectly relevant to later performance are related to licensing success, and it thus appears, that judges take these into consideration consciously or subconsciously during their evaluations. Behaviour related differently to licensing success in dressage versus show-jumping stallions, which may reflect the different demands and expectations judges place on dressage versus show-jumping horses, though it is questionable whether these differences are justified in all cases. More direct and objective evaluation of behaviour traits relevant for later sport performance could help to improve breeding success with regard to these traits.

Lay person message: Personality traits play an important, if not the most important role for riders at all levels, but selection for relevant behaviour traits is often neglected in favour of performance traits in modern horse breeding programmes. Our study shows that stallions' behaviour during licensing is to some degree related to licensing success, although it is not specifically evaluated. More objective evaluation of behaviour traits in horse breeding could enhance breeding success for these important traits and ultimately assist in enhancing equine welfare through genetic selection of horses with personalities that make them easier to train and less prone to stress.

Keywords: personality; stallion licensing; behaviour; breeding; temperament; character

LT16

EVALUATION OF APPROPRIATE WATER AND ROUGHAGE SUPPLY AND POTENTIAL CAUSES OF INJURIES IN HORSE HUSBANDRY IN GERMANY– A FIELD STUDY WITH BESTTUPFERD

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Animal welfare is of public concern when it comes to the keeping of farm animals including horses. Husbandry systems are diverse and might not always provide appropriate living conditions for horses. However, data based on holistic assessments of yards are scarce. Therefore, a scientific consultation tool is being developed in Germany to assess, analyze, and improve shortcomings of animal welfare on site. Feed intake interruption (i.e. time spans between roughage meals; n=1452 horses on 29 yards), the amount of water flow (litres per minute for n= 320 drinking troughs) and dangerous clearances and openings (5 – 30 cm) in elements such as partitions and feeding equipment (existent 1-2 times vs. existent ≥3 times vs. non-existent for n=340) were examined on yards with single (SH; n= 28) and group housing (GH; n= 20). Differences in single versus group housing were tested using Linear Models in R. The physiological time span of not more than 4 hours between roughage meals was exceeded in 6.7 % of group housing and 71.4 % of single housing ($p<0.001$; trial 1 with n=15 group and n=14 single housing). Water flow was sufficient (>8l/min) in GH (40.0% vs. 10.7% SH, df=46, $p=0.01$) and suboptimal (3-8l/min) in SH (57.5% vs. 15.0% GH, df=46, $p<0.001$). Dangerous clearances and openings were found in ≥ 37% GH and ≥ 46.0% SH, however, only clearances on feeding equipment differed significantly between husbandry systems (SH= 14.3% vs. GH= 65.0% yards with ≥3 dangerous clearances/equipment, df=46, $p<0.001$). The results showed that most horse farms ~~husbandries~~ have a need for improvement concerning appropriate nutritional supply and the elimination of potential risks of injury within their yards. Therefore, the use of a digital consulting tool will support farmers with identifying and improving shortcomings within their horse husbandry systems.

Lay person message: In practice, the majority of horse farms did not provide sufficient water supply and exceeded the physiological time span between roughage meals. Potential risks of injury such as dangerous clearances and openings were found in most yards multiple times. A digital consulting tool is being developed in Germany in order to assist with the identification and improvement of shortcomings within horse husbandry.

Keywords: BestTUPferd; horse welfare; horse husbandry; horse nutrition; injury risk; feeding

LT17

ASSESSING HORSE WELFARE IN SINGLE AND GROUP HOUSING WITH THE ASSESSMENT TOOL *BESTTUPFERD*: RESULTS OF THE INDICATORS *INJURIES* AND *SPECIES-APPROPRIATE TURNOUT*

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Numerous scientific studies on diseases, behavioral disorders, and permanent impairments have demonstrated severe shortcomings in horse husbandry. We therefore aim at assisting yard and horse owners by providing a digital consulting tool to assess (tablet-based), analyze (web-based), and improve horse welfare on site (*BestTUPferd*). To identify valid, reliable, and feasible animal- and resource-based indicators of criteria concerning *affective states*, *behaviour*, *health status*, and *environmental sustainability* we so far conducted 88 tests on 46 horse farms (*n* = 2220 horses). This study presents results of the indicators *superficial lesions* and *species-appropriate turnout*. Three assessors distinguished superficial lesions (hairless patch of ≥2 cm diameter; categories: 0, 1-5, and ≥6 lesions) with very good inter-observer agreement (Kendall's *Wt* = 0.86-0.89; $p<0.001$, n=12 farms with 685 horses). We found a high prevalence for *superficial lesions*, especially in group housing (*n*=32 farms with 1,604 horses; 16 farms with group housing (GH) and 16 with single housing (SH); ≥1 lesions per horse in GH: 74.3 ± 16.0%, median: 80.0%, range: 45-95% versus in SH: 38.7 ± 14.7%, median: 40.0%, range: 15-75%; Wilcoxon Rank Sum Test : $p<0.001$). Injuries occurring in GH can be associated with dangerous objects, floors, or housing equipment. Furthermore, they can be ascribed to aggressive interactions due to resource scarcity (feed, places for resting, etc.). On 95% of the farms with GH (n=19 of 20), we recorded an integrated turnout area that was large enough and suitable for gallop (≥150 m^2 for one or two horses plus 40 m^2 for each additional horse). Such turnout areas give the horses the 24/7 choice for free locomotion. In contrast, single-housed horses depend on an intensive turnout management by the stable manager because they need to be brought to turnout areas and returned to the stable daily. On 41.7% of the farms with SH (n=10 of 24), 24.1 ± 20.4% of horses per farm were confined in winter (range: 6-63%), which is inacceptable in terms of animal welfare. The intended ubiquitous use of the digital consulting tool as a decision support system for horse farmers in Germany, and in the medium term internationally, will help remedy shortcomings in single and group housing including their management.

Lay person message: Group housing in particular offered species-appropriate turnout possibilities. However, superficial lesions were more common in group-housed than single-housed horses (median: 80% versus 40%). BestTUPferd will help yard and horse owners to objectively assess horse welfare, analyze automatically and choose out of several recommendations for action how to improve horses´ animal welfare status.

Keywords: free locomotion; prevalence of injuries; paddock; welfare indicator; consulting tool; welfare assessment system

LT18

SOCIAL PROXIMITY AS A POSITIVE WELFARE INDICATOR IN HORSE HUSBANDRY

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The aim of assessing animal welfare is to determine whether a positive welfare balance is given. That means that the sum of positive and negative experiences results in a positive welfare balance providing animals with greater opportunities for positive experiences, in addition to minimizing negative experiences, thereby providing a good quality of life. As found for many species, friendships (social bonds) are of value for the individual animal and are characterized by positive affect (liking). These positive welfare indicators have been neglected in published studies. During the course of developing a scientific consultation tool to assess, analyze, and improve animal welfare in horse husbandry (BestTUPferd) we examined the characteristics and modalities of the behaviour pattern social proximity as a positive welfare indicator. Social proximity was defined as follows: persistent (≥1 min duration) inter-individual spatial proximity (start distance ≤1.5 m) without the occurrence of agonistic behavior and given that avoidance is possible. We observed 50 adult horses on 9 days living in single housing with 8 hours daily turnout in one group on pasture in summer and on a paddock in winter. The mean distance of social proximity was 1.43 ± 0.58 (mean ± SD) m on a turnout area of approx. 100 m^2 per horse (paddock, n=1765 measurements) and increased to 4.25 ± 2.40 m on a turnout area (pasture, n=1445 measurements) of approximtely 700 m^2 per horse (n=39 horses; LM: frequency*distances, df= 48, regression coefficient for turnout area paddock = -102.45, p=0.026). Relevant influencing factors were space and growth of grass. Reliability was tested in a follow-up study with three observers. It took place on 12 different yards with 685 horses living in single (n=6) or group housing (n=6) in Germany. Horses were observed in a relaxed (R: horses not expecting scheduled feeding) and a tense phase (T: horses expecting scheduled feeding). The observers reliably assessed the behaviour (Kendall's *Wt* for R = 0.77 and for T = 0.80; $p<0.001$). Furthermore, the observation of social proximity proved feasible for short-lasting assessments (R: 0.51 ± 0.47 times per horse during 20 min of observation). Results showed that *social proximity* is affected by space allowance of turnout area. It could be assessed feasible and reliable. Further studies on validity are needed, but to date social proximity seems to be a valuable indicator of positive affective state of horses under husbandry conditions.

Lay person message: Social proximity describes friendly interaction between two or more horses. Our study shows that the distance between the horses having a friend varies according to their space allowance. In addition, social proximity is a feasible indicator of positive welfare in horses. That means it can be observed objectively and in a short period of time. Hence, it is possible to check an important aspect of horse wellbeing in an applicable manner.

Keywords: spatial proximity; positive affect; welfare assessment system; wellbeing

LT19

PRELIMINARY INVESTIGATION INTO THE EFFECTS OF CHIROPRACTIC TREATMENT AND COMBINED WITH ELECTROMAGNETIC FIELD THERAPY ON MECHANCAL NOCICEPTIVE THRESHOLDS OF HORSES

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McTimoney chiropractic treatment (MCT), a high velocity low amplitude spinal manipulation therapy, produces profound but transient attenuation of motor neurone activity. Pulsed electromagnetic field therapy (PEMF) has perceived pain-relieving effects and improves the reduction in muscle and fascial tension. Both are used in therapeutic protocols. The study aim was to assess effects of MCT and with PEMF treatment over a given time period on their ability to reduce sensitivity to pain of back musculature of horses compared to no treatment. The study objectively assessed the influence of MCT and PEMF therapy on mechanical nociceptive thresholds (MNTs) at 3 specific muscular junction trigger points (TPs) of the thoracolumbar musculature. MNTs are a measure of sensitivity to musculoskeletal tenderness. A controlled randomised study using 12 sound cob-type horses from the same yard and training schedule randomly assigned into 3 groups of n=4. Control group, no intervention; 2 treatment groups: (A) MCT only (10mins treatment) and (B) combined (MCT plus Biomag 2_{TM} PEMF mat(200hz) placed cranial to T18, 5mins per side). Stood square, triplicate MNTs were measured using pressure algometry on both sides at 3 muscle Equinology™ pre assessed TPs [TP 45(junction of spinalis, longissimus thoracis and trapezius thoracis); 47 (longissimus thoracis et lumborum); and 62 (gluteus medius)] at 4 time points 0(pre-treatment), 30(post MCT), 60(post PEMF), 150mins. Statistical tests: Shapiro-Wilk test, paired T- test compared left/right MNTs, ANOVA analysed group data for each TP over time with Bonferroni post hoc analysis. There was no significant difference ($p>0.05$) between left and right MNTs for all measurement sites. There were no significant changes in MNTs over time at all TPs for control group ($p>0.05$). There was a significant increase in mean MNTs pre-treatment to 150mins for both treatment groups (A: $p=0.03$, B: $p=0.01$). There were significant changes in MNTs for both treatment groups at each muscle TP. The study is limited by its sample size and timescale, but it has provided positive evidence that chiropractic and when combined with PEMF treatment shows a significant reduction in sensitivity to musculoskeletal tenderness (increased MNTs) over the time period compared to no treatment. Different muscle groups react differently to treatment, supporting the requirement for further research with a larger sample, on the difference in muscle tonicity effects and over a longer period.

Lay person message: Chiropractic therapy and Pulsed electromagnetic therapy are frequently considered for maintenance, competition and rehabilitation support of horses and their musculoskeletal health. Evidence of their effects on back musculature is important to understand for effective use. This study provides positive evidence of an effect on muscle tenderness in the back compared to no treatment. Further research is now warranted with larger groups and over a longer period.

Keywords: nociception; chiropractic; magnetic-field-therapy; musculoskeletal; tenderness

DAY 2 THEME 3: COMMUNICATION FOR CHANGE

PL3

CHALLENGES IN PREACHING FURTHER THAN THE CHOIR AND THE CONGREGATION TO IMPROVE HORSE WELFARE

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In the past 30 years we have seen unprecedented progress in the field of research into equine behaviour and equine welfare. At the same time the opportunity to communicate new knowledge with extremely high numbers of equine caregivers worldwide has increased exponentially through the world wide web. It may seem hard today to believe that in June 1993 there were only 130 websites where today we are approaching 2 billion. And we also have to possibility to communicate with equine caregivers through email and text and platforms such as You Tube, Facebook, WhatsApp and many online forums. But has the improvement in our knowledge of horses' needs been communicated to equine caregivers, as this is the primary route or mechanism by which welfare van be improved.

Equine welfare may be compromised for a variety of different reasons and ignorance is likely to be a primary cause in many situations. In some regions of the world equine welfare may suffer due to insufficient resources, such as trained professionals, lack of medicines and availability of suitable food and tack. Equine welfare may also suffer in circumstances where caregivers have insufficient money to maintain high standards of welfare. In some regions cultural beliefs may compromise welfare. Cultural beliefs can be defined as a set of behavioural patterns related to thoughts, manners and actions, which members of society have shared and passed on to succeeding generations. Challenging peoples beliefs, whether cultural or otherwise, often engenders a "fight or flight" response and anxiety. In this state the receiver will not be receptive. In both affluent and poor regions, the desire to win, to achieve status, often but not always accompanied by financial gain, can lead to compromised welfare through abusive practices, such as illegal use of medications. In elite sport this may manifest as illegal use of nerve blocks in competition. In poor societies the aim may be the same, e.g. to manipulate the outcome of an event for financial gain, often through betting, but the approach can be less subtle with the use of stimulant and psychotic drugs which would be easily detected in more sophisticated racing jurisdictions. Finally, we should not forget the impact of poor physical and mental health of caregivers on equine welfare.

Considering opportunities to improve equine welfare, education is probably the area in which there is the greatest potential for improvement. But education can only occur if there is engagement and this in turn requires communication. And today there is so much "noise" that it can be hard to reach our target audience. Furthermore, considering how we use communication extensively in our lives for everything from basic needs to entertainment, in some respects in my personal opinion, as a community (i.e. researchers, coaches, trainers, teachers, lecturers, organisers, legislators, stakeholders, etc) we still fail when it comes to engaging professionally with the majority of equine caregivers to affect positive change. This should perhaps not be a surprise. Communication, for example in marketing, is a huge field of "science" where consumer behaviour is studied and exploited for financial gain. I believe we are at a stage where we may need to use similar techniques more frequently to reach the "average" equine caregiver.

To achieve improvements in equine welfare on a large scale, we need knowledge of equine needs. I believe we are at a stage where we now have a solid knowledge base. We then need to prioritise the messages we want to deliver. We next need to understand who the audience will be and how to reach them. The messages need to be accurate, effective and efficient. I think accurate is self-explanatory. By effective, I mean that the message needs to reach the target audience AND have impact that helps drive a change in caregiver behaviour that leads to improved equine welfare. By efficient, I mean that we need to reach the maximum audience for the minimum "cost", whether that be in time or money or hours of number of people involved.

We have never had an opportunity to communicate so easily with equine caregivers to effect positive changes in equine welfare. At the same time, we have never experienced so much competition or "noise". The amount of confusion amongst equine caregivers is immense, as can be easily seen on the many Facebook groups when someone asks a question or starts a discussion. There is a reason many are choosing these forums to explore or engage with other caregivers and not engaging with those who have the knowledge. As a community, we need to consider that we have possibly contributed in some way to alienating the "ordinary" horse owner. In order to make a step change improvement in equine welfare we may, as a group, need to let go of our collective ego. No-one reading this abstract needs any convincing that there is poor equine welfare which could be relatively easily addressed with some simple education. The challenge is reaching a wider audience and being able to affect change. Hence, my choice of the title "challenges in preaching further than the choir and the congregation to improve horse welfare".

In summary, we have the knowledge as a community to make significant impacts on equine welfare. Engagement and education rather than confrontation is likely to a more effective strategy. We have to agree priorities for messages to communicate. We need to understand what strategies are likely to be most effective. I'm not convinced we currently have the answers as to the best approaches. Finally, these activities need to work alongside the work of other stakeholders in equine welfare and not try to replace or undermine them.

Lay person message: There are many challenges to equine welfare in our age. There have been significant advances in understanding the welfare needs of horses in the past 30 years but many of these have not been communicated to horse owners. Many horse owners are overwhelmed or confused by the volume of information available. In order to make step changes in equine welfare, those holding the knowledge need to agree priorities and engage rather than confront those who compromise equine welfare through ignorance as this may be the easiest target achieving the greatest return.

Keywords: communication; education; engagement; change; caregivers; ignorance

RP11

MOVEMENT AS MEDICINE: HORSE OWNER PERCEPTIONS OF THE POTENTIAL FOR MOVEMENT AND EXERCISE AS OPPORTUNITIES TO IMPROVE WELFARE

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Traditional equine management centres around individual stabling and limited turnout in simplistic environments. This conflicts with horses' intrinsic needs for freedom, friends, and forage. Restrictive management may trigger physiological issues (e.g., obesity) and psychological consequences (e.g., stereotypies). Obesity and its comorbidities are among the most pressing welfare issues affecting horses in the UK. Weight management typically focuses on nutritional restriction, often combined with social isolation, creating other welfare issues. Consequently, another remedy for obesity is needed, with increased exercise, both human-led and self-directed (e.g., via alternative turnout systems), being a viable option. This study aimed to explore owner practices and perceptions regarding movement, and to investigate how movement related to welfare outcomes. An online survey gathered 804 responses from UK horse owners. Data indicate that the majority of respondent's horses were managed in obesogenic conditions, and 40% were owner-reported as overweight/obese. Movement-related variables (e.g., if a horse was ridden) correlated with physiological welfare indicators (e.g., decreased risk of laminitis: OR=0.38, p=0.002; and Equine Metabolic Syndrome: OR=0.27, p=0.035), though excess weight was only predicted by breed type (OR= 0.23, p<0.001). Approximately 90% of respondents reported that barriers, mainly weather, riding facilities, and time, substantially limit opportunities to provide human-led exercise. Analysis of a hypothetical weight-management scenario found owners with horses at livery yards feel significantly less able to increase their horse's self-directed exercise (e.g. via movement-encouraging altered turnout areas) than owners keeping horses on their own properties (X^2=105.7, df=6, p<0.001). Binomial logistic regression results also indicated that horses kept at their owner's premises were less likely to display locomotor stereotypies than those on livery (OR=0.44, p=0.003). Principle Component Analysis on level of agreement with 17 belief statements relating to the respondent's own horse, and horses in general, identified three groups of horse owners: 'natural' owners prioritised the facilitation of normal behaviours, 'traditional' owners had comparatively anthropocentric beliefs surrounding equine management, and 'frustrated' owners expressed a strong desire to increase activity levels while conveying concern regarding their abilities to provide adequate care. This study therefore indicates that while increased movement may potentially improve welfare, owner knowledge is not the only obstacle that must be overcome to implement this prospective solution. Both human-led and self-directed exercise appear limited by a lack of opportunities available to horses and humans. These results provide justification for future investigations into alternative turnout systems as potentially viable methods of increasing movement and improving welfare.

Lay person message: Traditional management of domestic horses frequently involves social isolation, restricted movement, and species-inappropriate feeding, diminishing equine quality of life. A survey of 804 UK horse owners investigated the relationships between movement and welfare. Results showed that exercise can promote equine welfare, and though horse owners are often motivated to provide increased activity levels to their horses, they are commonly limited in doing so by barriers that are outside owners' control.

Keywords: exercise; movement; turnout; welfare; owner perceptions

RP12

IT'S JUST AN EMOTION: EXPLORING HORSE OWNER PERCEPTIONS OF EQUINE EMOTIONS

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The need to develop an Equine Quality of Life assessment framework based on evidence-based, observable behaviours that reliably reflect underlying emotional state is becoming clear. The aim of this study was to explore horse owners/practitioners' understanding and use of equine emotional state in their interactions with horses. An online survey comprising closed and open questions assessing owner/participant demographics, experience and interactions with horses, perceptions of equine emotions and information-seeking behaviour was distributed via social media snowball sampling. 2107 horse owners (n=58, 3% male, n=2033, 96% female, n=16, 1% undisclosed), aged 18-80+ years, n=1367 67.4% leisure riders, n=380 18.5% competitive riders, from 39 different countries participated. The majority had over 10 years' experience providing daily care for 2-5 horses (92%) with approximately 50% not having an industry or academic qualification. 99.7% believe horses have emotions, with 46% referring to horses as highly emotional, of which 16% report that horses have the same emotions as humans. Fear, curiosity, anxiety, wariness and contentment were the most frequently reported equine emotions (99.87%, 99%, 99%, 98% and 95% respectively). Guilt, awe, hope, pride and gratitude were the emotions (52%, 45%, 35%, 32% and 22% respectively) explicitly reported as NOT being exhibited by horses. Participants overwhelmingly found emotional state useful when trying to understand horses' behaviour during handling (95.3%), training (96.1%) and routine care (95%) and were significantly more concerned about negative emotions being exhibited than the horse showing positive ones (Chi-sq, df=1, =33.92; 30.2 and 25.5, all $p<.0001$ respectively). Despite recognising the importance of the absence of negative emotions during handling, training and routine care, participants did not see this as any more or less important than horses experiencing positive emotions to their overall wellbeing during these common horse-human interactions (Chi-sq, df=1, =3.25, 0.47 and 0.86, all $p>.05$ respectively). The majority (90%) of participants clearly acknowledged the importance of the correct interpretation of horses' emotions; only <1% did not consider it important. Participants identified the internet as their primary source of information about equine emotions, and rated the quality of material provided on social media as poor. For in-person information about equine emotions, participants favoured that provided by Behaviour consultants. It is critically important that evidence-based information about equine emotions and their importance to equine quality of life is made available to practitioners through a range of channels to assist them to safeguard the wellbeing of horses in their care.

Lay person message: Understanding horse emotions is key to ensuring a good quality of life. The majority of horse owners agreed that horses experience emotions such as fear, curiosity and anxiety. Owners were more concerned about their horses showing negative emotions, than them not

showing positive ones. This combined with owner's acknowledgment that social media-based information about horse emotions is poor, highlights the need for evidence-based information to help equine practitioners safeguard equine welfare.

Keywords: equine; emotion; state; human interaction; welfare; quality of life

RP13

INVESTIGATION OF A POTENTIAL LINK BETWEEN UK EQUESTRIANS' UNDERSTANDING LEARNING THEORY, AND THEIR PERCEPTION OF AND RESPONSE TO PROBLEM BEHAVIOUR

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Poor understanding of learning theory, vilification of the horse, and use of punishment in response to problem behaviour is commonplace throughout the UK. These shortcomings are likely to be detrimental to horse welfare. However, until now, no studies have explored these shortcomings in relation to the general equestrian population. Therefore, the aim of this study is to investigate the level of understanding of learning theory amongst the general equestrian population in the UK, and to explore how this relates to the way UK equestrians perceive and respond to problem behaviour. An online questionnaire was completed by 672 equestrians, aged 18+ years old, who had owned/loaned a horse for over 1 year. Only 16% percent of respondents correctly identified all four quadrants of operant conditioning from example scenarios. This result suggest that UK equestrians have a poor understanding of learning theory. Respondents who only correctly identified 1/4 quadrants of operant conditioning were significantly more likely to use the descriptors "naughty", "cheeky" and "disrespectful" to describe a horse that was performing a problem behaviour (napping), within an example scenario ($\chi^2(3)=63.673$, $P<0.001$; $\chi^2(3)=46.698$, $P<0.001$; $\chi^2(3)=26.838$, $P<0.001$, respectively). These findings suggest that equestrians with a poorer understanding of learning theory were more likely to use vilifying descriptors. Equestrians that were more likely to use vilifying descriptors (to describe the napping horse) were significantly more likely to use punishment in response to this problem behaviour: (naughty [$\chi^2(1)=60.103$, $P<0.001$], cheeky [$\chi^2(1)=24.728$, $P<0.001$] and disrespectful [$\chi^2(1)47.747$, $P<0.001$]). The results of this study provide evidence to suggest that there are shortcomings in the UK equestrian population's understanding of learning theory, and their perception of and response to problem behaviour. Therefore, these findings also suggest that interventions to improve UK equestrians' understanding of learning theory would lead to improved quality of life for horses.

Lay person message: It is of great importance that horse owners understand learning theory, since it allows for owners to optimise their horses' quality of life. A study of UK equestrians uncovered a poor understanding of this topic. The study also found that equestrians with poor understanding were more likely to blame horses and use punishment in response to problem behaviour. Therefore, improving equestrians' understanding of learning theory will improve horse welfare.

Key words: behaviour; learning theory; punishment; welfare

RP14

HOW HAPPY ARE EQUINE ATHLETES? STAKEHOLDER PERSPECTIVES ON EQUINE WELFARE ISSUES ASSOCIATED WITH EQUESTRIAN SPORT AND INDUSTRY USE OF WELFARE ASSESSMENT TOOLS

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The international governing body for equestrian sports, the Fédération Equestre Internationale (FEI), states that at all times the welfare of the horse must be paramount and never subordinated to competitive or commercial influences. However, with the number of stakeholders involved in the production of equine athletes from grassroots to Olympic level, adherence to this code of practice is increasingly questioned. The aim of this study was to explore stakeholder perceptions of current welfare issues within equestrian sport, attitudes towards assessing sport horse welfare, and views on using welfare assessment tools. Stakeholders from equestrian sport were invited to a workshop that included presentations on ethical and welfare issues within equestrian sport, followed by focus group sessions which aimed to encourage participants to consider the principles described in the presentations, in relation to their specific sport. Participants comprised industry stakeholders (n=48) including riders, trainers, judges and researchers. Four groups comprised discipline-specific participants (showjumping, dressage, endurance and eventing); one comprised other equestrian sports (e.g. racing, polo), and one comprised welfare staff and researchers. Participants specified their role in equine sport when applying to the workshop, and were selected on a first-come first-served basis according to a quota of maximum 12 participants in each group. All workshops were recorded, anonymised and analysed using an inductive thematic analysis with themes developed iteratively according to three stages (familiarisation, initial coding, refinement), using a constructivist epistemology. Results highlighted that a welfare concern expressed across all equestrian sporting disciplines was the conflict between trying to meet both the horse's needs and the demands of competition. Compromises were frequently required and there were conflicting stakeholder opinions in relation to what was acceptable. While the physical health of equine athletes was closely monitored, participants were concerned that horses' psychological needs were sometimes overlooked. Competing horses at a young age was generally considered inappropriate, but the demands of the competitive stakeholder network often necessitated this. Assessing a horse's affective state was rarely considered in relation to competitive performance, but it was in other contexts. Participants perceived the term 'welfare' to have negative connotations, and alternative terms, such as quality of life, were preferred. Participants could see the benefit of using a welfare assessment tool, but existing tools were rarely used. Future development of welfare assessment tools requires collaboration between welfare scientists and equestrian stakeholders to improve the likelihood of uptake and relevance within equestrian sport.

Lay person message: Horse welfare in equestrian sport is increasingly subject to scrutiny from within and outside the sport. Group discussions involving equestrian sports participants and welfare

scientists identified many welfare challenges. Participants highlighted the conflict between meeting the horse's needs and the demands of competition, and the lack of consideration of horses' mental well-being during competition. There was support for developing tools to measure welfare but better collaboration between scientists and stakeholders was necessary to increase uptake.

Keywords: horse; equine; welfare; quality of life; sport; horse-human-relationship

RP15

ADDRESSING THOROUGHBRED WELFARE AND MANAGEMENT ISSUES POST-RACING

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The fate of Thoroughbreds post-racing is under increasing public scrutiny, due to the challenges of welfare, rehoming, retraining and the end-of-life management. In 2020, key Australian stakeholders including the national bodies for Thoroughbred breeders, trainers and jockeys, allied with race clubs to establish the Thoroughbred Aftercare Welfare Working Group (TAWWG). This independent panel was tasked with making practical policy recommendations to improve welfare outcomes for horses exiting the racing industry, whether as retired racehorses or unraced animals. Public submissions to address seven main issues covering good welfare, Thoroughbred breeding, Thoroughbred traceability, programs for retired racehorses, end-of-life management plus research, development and education were called for. The Equine Science Group at Charles Sturt University were uniquely positioned to contribute, given their breadth of knowledge, applied research and industry contacts, both nationally and internationally. Each team member contributed in their area of expertise; defining good welfare and equine quality of life assessment; addressing the biomechanics of racehorses and injury rehabilitation; the management of Thoroughbred foals and breeding to reduce wastage; the viability of a national traceability register plus the effectiveness of programs for retired racehorses to improve horse welfare and the capacity of the equestrian sector to rehome ex-racehorses; the options for end-of-life management and the identification of priority research areas. While some in-roads into addressing these issues have been made by different sectors, overall the approaches lack cohesion and clearly identified common goals. There are around 13,000 Thoroughbred foals born each year in Australia, of which 28% (3640) do not ever race. This suggests that about 9,300 horses enter race training each year. The number of race meetings, races and average runners per race remains relatively constant, implying a stable population. Current data suggest that just under 10,000 horses exit racing each year and need to be managed appropriately in Australia alone. Over a decade close to 100,000 Thoroughbreds require rehoming and to be provided with suitable environment, nutrition, health care and behavioural opportunities. Priority research into animal-based welfare indicators was identified, predominantly categorizing affective states with a focus on validity and robustness that will enable Thoroughbreds that are no longer racing to be rehomed and repurposed in a way that does not compromise their welfare and ultimate quality of life. This research could potentially improve the welfare outcomes of all horses, not only Thoroughbreds.

Lay person message: The fate of the thousands of Thoroughbreds that retire from racing each year is of great concern. Seven main issues have been identified which need to be addressed to ensure that horses are appropriately provided for in their post-racing homes. To ensure the needs of these retired Thoroughbreds are adequately addressed, reliable and easy to use animal-based welfare indicators are needed to ensure their post-racing quality of life.

Keywords: Thoroughbred; retired racehorse; post racing; welfare; rehoming; quality of life

K3

THE POWER OF WORD CHOICE – CASE IN POINT, THE WHIP/CROP DEBATE

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Close your eyes for a moment and picture the following scenario: 'the jockey picked up the crop and used it to encourage the horse forward for a final burst of speed,' 'the jockey whipped the horse multiple times during the final stretch, seemingly to punish it for not giving its full effort.' Do you judge the two scenarios differently? Do we know anything about the actual amount of force that was used to strike the horse? Do we know if any welts resulted from the jockey's efforts? Do we have information about the horse's behavioral response? Another scenario: 'the jockeys expressed concern about not being able to use the padded riding crop to prevent a horse from veering out' vs 'the protesters were furious that the riders were allowed to whip the horse repeatedly during the stretch, which anyone could see was cruel and abusive'.

When we study equine welfare, we quickly learn that the 'power of words' enters heavily into any debate/discussion of a contentious topic. Remaining dispassionate and choosing minimally emotive words/phrases is taught to us as being essential to being an unbiased scientist; yet sometimes it feels the only way to make forward progress is to intentionally choose some highly emotive words to evoke a greater response. Sometimes it seems that the layperson media makes quicker progress moving a topic forward with provocative verbiage as compared to more neutral statements. How do we move a topic area from 'a war of words' to an evidence-based consensus amongst stakeholders? What happens if scientists produce evidence, say, that horses feel pain in mostly the same way as humans and that learning theory principles don't support the horse understanding 'encouragement' from a whip? And yet the most influential stakeholder groups don't wish to accept the findings of the scientific evidence?

Over the past 10 years, considerable research effort has been devoted to quantifying aspects of whip/crop use in racing. Stakeholders who view whip use negatively have shown escalated concern. This issue appears to threaten horse racing's Social License to Operate (SLO). In the past decade, McGreevy and colleagues have published over 20 peer-reviewed articles related to whip use in racing; e.g. the force generated by 'typical' forehand and backhand jockey whip strikes, how often whip use rules are breached, the percentage of whip strikes landing on the flank (a prohibited strike region). Their research group found evidence that apprentices hit more than senior jockeys, found the percentage of whip strikes causing visible indentation on the horse's skin (83%) and the number making contact with the unpadded section of the whip (64%). More recent work has shown that the energy-absorbing composition of the 'new'/innovative whips displace less material (i.e. land with lower force) than the 'older'/more traditional whips. One of the most compelling pieces of evidence is that horses' skin is no less likely to feel pain than human skin; furthermore that when data from whipping-free and whips-allowed races were matched (n=126, UK), no significant differences were found for finishing times nor steward concerns. Regarding public perception and SLO, a Nexis Uni® search using the key words of 'racehorse' and 'whip' or 'crop', for the past 10 years, showed over

8,300 media articles, with most reflecting 'negative' sentiment. Several polls over the past decade (e.g. USA, UK, Australia) consistently demonstrate largely negative public perception (> 70%) toward whip use for encouragement, and in the recent British Horse Welfare Board document 'A Life Well Lived,' 10 pages were devoted solely to the issue of whip use in racing. They have called for 'evidence-based decision making' regarding whip use in racing. Many racing jurisdictions worldwide have implemented stricter whip use rules over the past few years, but some stakeholder groups continue to resist these changes. It is likely that public perception evidence and ethical assessment will be equally as important as the empirical evidence related to whip use.

Lay person message: Words have more power and carry more weight than we often give them credit for. One example of this is regarding the whip/crop debate. It appears that stakeholders who are mainly favorable toward the whip/crop are very anti the 'whip' term; whereas stakeholders who are mostly concerned seem to avoid the crop/stick term. The terminology, however, does not help us get to the bottom line of how this instrument impacts horse welfare and jockey safety.

Keywords: horse racing; racehorse; whip; crop; horse welfare; social license to operate

LT20

AN INVESTIGATION INTO FACTORS INFLUENCING UK EQUESTRIANS' UNDERSTANDING OF LEARNING THEORY IN RIDDEN HORSE TRAINING

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Learning theory (LT) is used to understand behaviour modifications due to associations that horses learn between stimulus and response during training. Where this stimulus-response-reinforcement relationship is not understood by equestrians, there is potential for training to cause confusion and conflict behaviour in horses. Understanding of LT and its application is therefore recommended for all equestrians. This study aimed to investigate equestrians' knowledge of LT, based on their understanding of negative (NR), positive (PR), and combined reinforcement (CR), and positive punishment (PP) and aimed to determine whether exposure to, and education in LT, would influence understanding. An online survey comprising 40 questions was distributed via social media, returning 830 completed responses. Questions were predominantly closed MCQ questions, however, open-ended questions were used to determine understanding of LT with participants asked to provide free-text examples of the use of NR, PR, CR, and PP in ridden training. Frequency analysis was performed to describe the number and percentage of occurrences of responses to closed questions and, for free-text responses, key words and phrases were identified and marked according to published definitions to categorise understanding as either correct or incorrect. Binary logistic regression modelling was used to identify whether certain variables were possible predictors of correct understanding and exposure to LT. Of those surveyed 54% (n.448) had an incorrect understanding of LT, despite 75% (n.624) reporting to use it, with NR and PP having the highest levels of incorrect understanding (59%,n.490; 52%,n.433). The multivariable logistic regression model identified exposure to LT as the most significant predictor of understanding ($p<0.001$), with even a minimal level of exposure increasing the likelihood of understanding ($b=-1.293$; $p<0.001$; $OR=0.275$; 95%CI:0.138,0.545). Equestrian education, defined as a nationally recognised vocational (BHS, NVQ/BTEC, UKCC) or academic qualification (university degree or higher) was not found to be a statistically significant predictor of understanding ($p=0.063$) and having vocational qualifications decreased the likelihood of exposure (positive b value). This study highlighted confusion among equestrians around the terms positive and negative in the context of LT and suggested this is potentially due to a lack of exposure, particularly through vocational education. Using NR and PP in training without understanding how they work has the potential to negatively impact horses' welfare by inciting conflict behaviours. However, further research is required to assess whether the lack of understanding identified translates to incorrect application, or whether it is simply a theoretical problem relating to terminology used between practice and science.

Lay person message: Horses learn by making associations between an action and perceived reward or punishment, and incorrect understanding and application of these methods can potentially compromise welfare. This study found that, although 75% of UK equestrians said they apply learning theory as their training methodology, the majority of these had never received any formal exposure to it and were unable to demonstrate a correct understanding of it, therefore increasing the likelihood of incorrect application.

Keywords: learning theory; education; equitation; training; behaviour; understanding

LT21

AN EXPLORATION OF THE LANGUAGE USED BY UK LEISURE HORSE OWNERS WHEN DISCUSSING EQUINE QUALITY OF LIFE

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"Quality of life" (QoL) assessment is well-established in human medicine and the term is routinely used by equine stakeholders, despite lacking a validated equine QoL scale. Terminology associated with QoL is ill-defined, and little is known about how stakeholders understand and apply QoL. This study sought to establish how UK leisure horse owners construct a 'good life' for their horse by exploring their use of language. This paper reports qualitative data collected from four online focus group discussions (FGD), each with 3-7 participants (N=21 in total). Targeted social media advertisement was used to recruit UK horse owners representing a range of ages, locations and equine experience. Male participants were recruited for the final FGD. Two researchers facilitated FGD utilising a topic guide and a group activity involving comparison of terms; quality of life, welfare, life worth living, wellbeing, happiness, good life and best life. FGD were audio recorded and transcribed verbatim. Data were analysed using a constructivist grounded theory approach. Three researchers inductively co-coded one transcript, following which a codebook created within N-Vivo enabled application of codes to all transcripts. Main categories and their relationships were examined through constant comparison of data. Commonalities in the use of terms are described, but meanings for individual participants were constructed through their own experiences as well as social contexts. A conceptual model was developed to represent how horse owners narrated this navigation of a good life for their horse. Participants constructed wellbeing through monitoring their horse's physical and mental health. Emphasis was placed on knowing the individual horse and participants reflected a sense of responsibility for decision-making. *QoL* was considered in relation to older horses or end of life, or at times requiring prioritisation of aspects of a horse's life, for example, due to disease. *QoL* was used to express understanding of outcomes for the horse resulting from construction of a "good life". *Welfare* was used primarily relating to concerns around a third party's horse, or when describing a particular concern around a participant's own horse's physical or mental condition. *Happiness* was used spontaneously when discussing participants' own horses, but was considered unmeasurable when compared with other terms. To improve equine QoL, appropriate and consistent terminology must be used to communicate with horse care-providers. The conceptual model could be used by equine carers to establish a shared understanding of terms relating to an individual's QoL which will aid communication between stakeholders.

Lay person message: The language associated with quality of life (QoL) is ill-defined and little is known about its use or understanding amongst people caring for horses. 21 UK horse owners took part in focus group discussions exploring equine QoL. A conceptual model was developed from the data to represent how horse owners narrated their navigation of a good life for their horse. This will be used to aid communication between stakeholders when discussing equine QoL.

Keywords: human-horse relationship; quality of life; welfare

LT22

WHAT ADVICE DO EQUINE PHYSIOTHERAPISTS PROVIDE IN 72 HOURS FOLLOWING INTERVENTION?

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Human physiotherapists provide post treatment soreness advice to patients within 0-72 hours after intervention. The exact cause is unknown but anecdotally post treatment soreness is thought to increase as an effect from certain interventions, such as massage. Despite knowingly inducing temporary tissue soreness the benefit of physiotherapy has been evidenced, supporting its application. However, it is unknown if physiotherapists consider post-treatment soreness to occur and if advice is provided to aid animal welfare following equine intervention. It is also apparent with varying equine physiotherapy educational routes and no treatment guidelines to follow, discrepancies amongst clinicians may occur. The aim of the study was to identify if advice is given in current practice within 0-72-hours following equine intervention, and if so, why and what variables affect the advice given. A mixed method approach was used via an online questionnaire by the means of social media and professional bodies. Frequency analysis was performed for theme identification from the open questions whereas percentages and median values were used to analyse ordinal data. A Two-Way Chi Squared test was used to test for difference between physiotherapist qualifications and years of experience. Advice was prescribed by 100% of the sample including chartered (n=42) and non-chartered (n=22)) physiotherapists within 0-72 hours following intervention. Turnout and in-hand exercises were commonly advised in 0-24 hours (p=0.870) to maximise intervention benefits, alongside awareness of the risk of soreness after treatment. In 24-48 hours, the largest variation in advice given was evident than any other time frame ranging from ridden to unridden (p=0.753). In 48-72 hours, advice focused on increasing ridden work and returning the horse to its usual exercise routine (p=0.107). Despite the findings within 24-48 hours no statistically significant differences between the categories were found. Assessment findings, owner experience and the competition schedule of the horse were the most common variables affecting advice e. Results found equine physiotherapists commonly provide advice within 0-72 hours following intervention, demonstrating awareness of the risk of post treatment soreness. The variation in 24-48 hours is apparent from unridden to ridden exercise therefore greater specificity is needed to form future clinical recommendations. The study also highlighted variables affect the advice provided which could be why differences exist in practice, alongside clinician clinical reasoning. Results ultimately reinforce the awareness of equine welfare and the balance of physiotherapeutic benefit in practice but further research is required.

Lay person message: In human physiotherapy advice is given to manage the effects of post treatment soreness, e.g., following massage. The research therefore investigated if equine physiotherapists also provide advice to horse owners within a 72-hour period and if so, what advice and why. Results found advice is provided to manage post treatment soreness however a large variation exists between 24-48 hours alongside different variables. Future research is required to formulate guidelines to facilitate standardised practice following physiotherapy.

Keywords: equine physiotherapy; maintenance physiotherapy; advice; welfare; owner advice; post treatment advice

LT23

AN INITIAL INVESTIGATION INTO SELF-PERCEPTION OF BODY IMAGE IN FEMALE QUESTRIANS IN THE UNITED KINGDOM THOROUGHBRED RACING SECTOR

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Body image has been found to affect performance, sport participation and self-confidence. Female body image (BI) has been investigated in non-equestrian sports, and recently in the non-thoroughbred sector, yet, within racing where jockeys and some work riders must comply with weight allocations, there is little information. Female participation in thoroughbred (TB) racing in the UK is increasing and has recently garnered media interest due to high profile success of female jockeys at prestige events. Equestrianism in general is unique as male and female participants compete on an equal footing with no sex segregation. Having said this, in TB racing, the gender bias remains male, possibly adding pressure on female jockeys to conform to a body shape and weight that may not be easy to achieve due to hormonal influences on female metabolism. This study aimed to identify perceptions of female equestrians BI within the UK TB racing sector, both of their own BI and of the ideal BI for women in racing, any trainer bias and highlight relationships between female equestrian BI and self-consciousness. A 4-part, 27 question online survey on GoogleForms™ was distributed, still open for data collection, via specific social media platforms and was completed by a range of female equestrians (n=73) based in the UK TB racing industry. Participants supplied demographic information, self-perceived BI and ideal female racing BI (rated on a validated scale from smallest A to largest J), and self-consciousness while race and work riding. Additional details such as trainer perceptions were also gathered. From the initial data gathered to date, preliminary results Showed the second smallest body image on the scale (B) was perceived to be ideal for the female equestrian in TB racing (X^2 = 28.2055, P<0.001). Significantly more riders felt that they wanted their BI to be smaller (X^2= 20.2466, P<0.001) and therefore were categorised as dissatisfied with their BI. Additionally, significantly more than expected riders had been told by their trainers to improve their strength (X^2= 27.0685, P<0.001), and fitness (X^2= 18.6027, P<0.001) to improve their riding ability. Female race riders who are dissatisfied with their BI may well be impacting the performance and welfare of the horse due to associated low self-confidence and may well be discriminated against by trainers, or at least feel they are which may lead to inappropriate eating habits negatively impacting both physiological and psychological health, challenging the concept of “one welfare” in TB racing.

Lay person message: There may be a disparity between self-perception of body image and that of the “ideal” body image in females in Thoroughbred racing, as seen in other equestrian sectors. There may also be a perception of trainer bias towards certain body sizes, impacting the allocation of rides, although this may be appropriate to ensure horse welfare. However, these perceptions may lead to disordered eating in females and challenge the concept of “one welfare” in thoroughbred racing.

Keywords: horse riding; jockeys; self-confidence; physique

LT24

DEVELOPMENT AND VALIDATION OF A TEST TO IDENTIFY WHETHER A HORSE IS BROKEN (TAMED) OR UNBROKEN (UNTAMED)

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Transportation is a stressful event for horses potentially leading to poor health and welfare. Welfare outcomes include behavioural and physiological responses that are more severe in untamed horses resulting in an increased risk of disease, injury, and exhaustion. The Regulation 1/2005 of EC, therefore, established stricter rules for the transportation of untamed (called unbroken in the law) horses in regards to journey length and practices. However, a formal test to define horse level of tame does not exist yet. This study aimed to develop and validate a reliable behavioural test to identify whether a horse is tamed or untamed. The proposed broken-unbroken test (BUT) consists of two phases: first, the tester approaches and tries to halter the horse, and then tries to lead it three steps forward and three steps backward. The horse behaviour during each phase is scored on a 3-point scale, then the scores are summed up to obtain a Total score (TS) ranging from 0 to 4. According to the optimal cut-off of the TS, the horse could be then classified as broken or unbroken. One hundred horses of unknown level of tame were tested by an expert applying BUT. The expert judgment following the learning theory principles of ISES was treated as the gold standard criterion. Four blinded observers, as well as behavioural responses (e.g. avoidance distance, AD) and respiratory rate (RR), were also used to validate BUT. Agreement analyses supported the excellent inter- and intra-observer reliability of BUT (Intraclass correlation coefficient >0.75). Moreover, TS was negatively associated with RR, AD, and the time needed for the tester to approach, halter, and lead the horse ($P<0.05$). The optimal cut-off value to discriminate between broken and unbroken was TS≥2, resulting in 97.8% sensitivity and 97.3% specificity. These findings confirmed the construct and criterion validity of BUT. Overall, the proposed test could provide official veterinarians with a valid and feasible tool to identify whether a horse is tamed or untamed and, consequently, direct stakeholders towards the correct transport procedures.

Lay person message: The European legislation establishes differentiated rules for the transport of broken and unbroken horses. However, there is no formal test to identify their level of tame. The study aimed to develop and validate this test. Our results show that the proposed test allows identifying whether a horse is tamed or untamed and could be a useful tool to verify law compliance and to improve equine quality of life during transportation.

Keywords: transport; transport regulation; behavioural test; validity; reliability, welfare

LT25

INFLUENCE OF RIDER WEIGHT, RIDER SKILL AND HORSE CONFOMATION ON HORSE BEHAVIOUR DURING RIDING

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With increasing levels of obesity in riders (as well as horses) in the Western world, there is increasing concern for equine welfare, when horses are ridden by heavy riders. Several associations started suggesting maximum allowances for rider weight, most commonly defined in relation to horse weight. However, a horse's weight-carrying ability is certainly not only determined by its own weight, but rather additional factors such as its nutritional and training status, conformation, saddle fit as well as rider skill. Therefore, the aim of the present study was to assess the impact of rider:horse weight ratio, horse conformation and rider skill on horses' behaviour during riding. Ten horses (311-560kg body weight, 138-162cm height) participated in the study, and each horse was ridden by two riders (N=20 in total) of different body weight (39-80 kg). Various aspects of conformation (e.g., back length, body length (range: 130-160 cm)) and body condition were evaluated in the horses. All horses wore saddles fitted individually by a saddler and riders rode a standardized dressage task. All rides were video-taped. Counts of conflict or discomfort behaviour such as head tilt, tail-swishing and mouth-opening were summed for analysis. A riding instructor (IW) scored different aspects of riders' posture (e.g., lateral symmetry, head posture) and precision of aids on a scale from 1 (ideal) to 3 (poor) with individual, trait-specific definitions of scores. Contrary to our predictions with regard to horse conformation, generalized linear mixed model analysis revealed that increasing rider-body-weight to horse-body-weight ratios (range: 0.10-0.19) resulted in increasing levels of discomfort behaviour in the horses with shorter, but not with longer bodies relative to horse height (height:length ratio range: 0.96-1.09; GLMM: -396.75±133.55, Wald-χ^2df=1, z=-2.97, p=0.003). Also, with less precise rider aids, more conflict behaviour was observed (GLMM: 0.19±0.10; Wald-χ^2df=1, z=1.95, p=0.05). For other conformation parameters such as the relation between cannon bone circumference and horse body weight, no relationship with horse behaviour was found (all p>0.05). Results show that both rider:horse-weight-ratio and rider skill influence horses' discomfort behaviour. In comparison, horse conformation appears to play a minor role. As a limitation to our study, it should be noted, that neither with regard to horse conformation nor to rider body weight, extreme phenotypes participated. Also, rider skill was generally low in the present study, and it may well be possible that a well-skilled, heavier rider may produce fewer discomfort in the horse than a less skilled, more light-weight rider.

Lay person message: Heavier riders paired with horses with short backs induced more discomfort behaviour in their horses during riding compared to lighter riders paired with horses with long backs. Also, horses reacted with more conflict behaviour to less skilled riders that gave less precise cues. In contrast to rider weight and skill, horse conformation seems to play a minor role with regard to discomfort behaviour in the horse.

Keywords: rider weight; weight-carrying ability; obesity; welfare; conformation; rider skill

LT26

PILOT STUDY TO INVESTIGATE WHICH EXISTING QUALITY OF LIFE ASSESSMENT TOOLS ARE MOST FEASIBLE FOR EQUESTRIANS TO USE UNDER GENERAL FIELD CONDITIONS

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Quality of life (QoL) assessment is used to determine clinical health of equines with reference to physiological and emotional welfare. QoL measurement should be feasible in the field in order to increase the use of this form of continual assessment among the equestrian community. There are a number of tools available to support assessment of equine QoL but none have been universally accepted to date. This study investigated the feasibility of the currently available published and validated equine QoL assessment measurements as part of the AESE QoL case study project 2021. An anonymous survey was created using Microsoft Forms. The survey was distributed through the social media platform Facebook to equestrian related interest groups with 91 respondents to the pilot survey. However, the survey is still open and therefore the data within this paper are preliminary. Respondents were asked to rate the feasibility (Very Infeasible - Very Feasible) on a Likert scale, of individual measurements taken from 5 QoL tools (the Five Domains Model, AWAG, AWIN, EARS, E-BARQ) which has been previously placed into groupings of physiological, environmental, behavioural, social, discipline and human effects. The results indicated a general lack of awareness and use of QoL assessment with 58% of respondents having never heard of any of the QoL frameworks and 76% having never used them. The most popular reason for infeasibility was lack of access to scientific equipment with 81% of respondents identifying this as a potential barrier to assessment. However most QoL measurements were found to be feasible but there were significant differences in the levels of feasibility between the 12 physiological variables (Kruskal-Wallis, H_2=184.82, p<0.001), thirteen environmental variables feasibility (Kruskal-Wallis, H2 = 248.38, p < 0.001), ten behavioural measures (Kruskal-Wallis, H2 = 109.87, p < 0.001), four social measures feasibility (Kruskal-Wallis, H2 = 18.31, p < 0.001), six discipline related measures (Kruskal-Wallis, H2 = 9.92, p > 0.05) and five human effect measures (Kruskal-Wallis, H2 = 1.26, p > 0.05). Overall, the results indicate that further research into layperson utilisation of equine QoL measures is required to fully identify uptake of this vital ongoing measure of welfare and to improve accessibility and feasibility of measures and protocols where practicable in order to enhance equine welfare in the field. This survey will be continued to collect further responses from a wider equine audience to fully understand the issues raised within these preliminary findings.

Layperson message: Quality of Life (QoL) assessment in horses is a vital aspect of the ongoing care and husbandry process. There are a number of published and previously validated measures and frameworks to assess and record equine QoL however these are not well known to or recognised by equestrians in the field. The significant majority of horse owners and riders are not aware of the existence of these frameworks and where they have awareness many choose not to utilise them due to perceived infeasibility of some methods. Further research into improving accessibility and feasibility of measures and protocols where practicable may enhance equine welfare in the field.

Keywords: equine; welfare; health; assessment; frameworks; feasibility

LT27

HORSE TRAILER DESIGN IN AUSTRALIA: WELL INFORMED OR BEST GUESS?

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The emerging discourse around the use of horses used for pleasure and competition raises questions about the effects of transportation on equine safety and welfare. Horse trailers have evolved from basic boxes on wheels in the early 20th century to more sophisticated vehicles in the present day, but their design in terms of horse safety and welfare has changed very little. The aim of this desk-based study was to first, provide an appraisal of what is known about the welfare of horses during transport and second, examine the regulation of Australian horse trailer design and evaluate how it is informed by contemporary equine transport research outcomes relating to the welfare of horses. A comprehensive review of the peer reviewed literature (including sources over 20 years old if they are still regularly quoted by current horse transport researchers) revealed that horses frequently suffer welfare compromising conditions during transport. Peer-reviewed publications were located using Google Scholar and Charles Sturt University Primo Search with the following search terms: horse; equ*; transport*; float; trailer and welfare. Resulting papers scrutinized for suitability on the bases they related to the transport of horses and ponies. A systematic search of legislative and regulatory requirements for manufacturing horse trailers in Australia revealed that at the current time there are no regulatory standards in place, neither nationally nor at state and territory level, to ensure safer, less stressful transportation for horses. Data were gathered on 57 different horse floats from all 21 manufacturers in Australia. Varying amounts of information was publicly available on manufacturers' websites. Whilst there was information on the provision of human facilities within and attached to the trailer, and the ability to customise, there were few mentions of horse safety, welfare or even comfort. This series of reviews and analyses indicate that Australian horse trailer manufacturers have made little to no use of the accumulated knowledge from scientific studies investigating horse welfare during transportation to inform the design of horse trailers manufactured for the Australian market. This is particularly worrying given horses are regularly transported over significant distances and exposed to high ambient temperatures in Australia. Given the increasing emphasis on individual horse welfare and the prevalence of transporting horses in the modern-day equine industry it is critically important contemporary research into the impacts of the physical design on the physiological response of the horse is used to inform future horse trailer design, and where possible adaptations to existing ones.

Lay person message: Despite horses regularly being transported there is little evidence trailers being designed specifically with the horse's welfare in mind. In Australia horse transport design legislation and regulation is lacking and manufacturers focus providing for human- rather than horse- needs. Despite transport being one of the most risky procedures horses undergo and the worldwide increase in concern over horse welfare, it is worrying that up to date knowledge is not being better used to ensure the horse's Quality of Life.

Keywords: horse trailer; safety; regulation; design; welfare; equine quality of life

LT28

SHADE AND SHELTER USE IN PADDOCK KEPT HORSES IN AUSTRALIA

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There is increasing evidence to support the recommendation of providing horses adequate shelter, either man-made shelter or natural shade, in order to safeguard the welfare of the horse. Research has shown weather conditions, particularly extreme temperatures, influence the horse's shelter seeking behaviour and ability to successfully thermoregulate. The aim of this study was to investigate factors that may influence horse's shelter seeking behaviour. Time of day, weather conditions, and type of shelter/shade were investigated. The shelter seeking behaviour of 19 university-owned mature horses was observed for 7.5 hours per day between 9 am and 4.30 pm over a period of six days during winter in Australia. Horses (4 mares and 15 geldings) were kept in groups of n= 7 (mix of mares and geldings) to 12 individuals (all geldings) in paddocks with free access to artificial shelter (AS, open sided metal structure) and natural shade (NS, trees/bushes high (>2m) and dense enough to provide solid shade). Horse location was observed at hourly intervals during the day and recorded along with actual time of day, ambient temperature, and prevailing weather conditions. No relationship was found between time of day and occupation of shade/shelter. Horses spent most of their time in the sun (85.5%), compared to Natural Shade (10.2%) and Artificial Shelter (4.3%). Horses were more likely to seek Artificial Shelter during foggy/cloudy conditions and Natural Shade when it was partly cloudy. Out of the two shade types, horses spent significantly longer time occupying Natural Shade as opposed to Artificial Shelter (Chi-squared=33.2, $p<0.00001$). Although Artificial Shelter and Natural Shade were not utilised for the majority of the time during this study, it does not mean that they are not important for the thermal comfort of the horse. Horses still displayed shelter seeking behaviour during conditions that may not be deemed extreme, e.g. fog. With the increasing interest in animal-based welfare indicators and individual horse quality of life, further research to determine what constitutes acceptable shade provision would be beneficial.

Lay person message: Access to shade helps horses control their body temperature under hot conditions, and shade seeking behaviour is evident in weather conditions that are not considered inclement e.g. when overcast. Although group kept horses spent most of their time in the open paddock, they occupied shady areas for 15% of their time, preferring natural tree shade to artificial shade. Further investigation of shade-seeking and shelter use could contribute to assurance of horse welfare and quality of life.

Keywords: horse; behaviour; welfare; shelter; shade; thermoregulation

LT29

ASSOCIATIONS BETWEEN COMMONLY USED APPARATUS AND CONFLICT BEHAVIOURS REPORTED IN THE RIDDEN HORSE IN AUSTRALIA

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Equestrian apparatus is often used to maintain control of horses while riding, driving or handling them and therefore to optimise human and horse safety. However, apparatus that has been incorrectly selected or inappropriately used may result in horses developing conflict-related behaviour. Characterising associations between apparatus use and unwelcome horse behaviour could benefit both horse welfare and human safety by elucidating the ontogeny of undesirable equine responses and promoting the ethical use of apparatus. The aim of this study was to explore associations between commonly used apparatus and rider-reported behaviours of the ridden horse. An online survey of 31 questions conducted in 2015 to audit apparatus used to apply aversive stimuli to ridden horses and ponies in Australia, provided unpublished data for 1101 respondents (82% female, 17.1% male and 0.3% non-disclosed gender) in relation to unwanted horse behaviours when ridden. Respondents were asked for information regarding a single horse ridden most in the last 12 months, using a 5-point Likert response scale. The 11 ridden behaviours were: *horse pulls head forward and down, anticipates cantering, bolts, bucks, rears, shies, is sensitive to leg cues, needs strong leg cues to canter, easy to steer, stops easily,* and *loves to jump obstacles.* 90.6% reported at least one problematic ridden behaviour. Chi-square tests of association revealed thirteen (9.1%) significant relationships between any unwanted behaviour and single items of apparatus used during riding. Analysis of combinations of apparatus that impose aversive stimuli (e.g. harsh bits for deceleration, and spurs for acceleration) revealed that 37.19% (N=121) of combinations of such items were significantly related to unwanted equine behaviours or behaviours indicative of conflict. A series of binary logistic regression models identified risk factors (majority = moderate risk) for the occurrence of undesirable ridden behaviours. This study has demonstrated non-causal associations between unwanted ridden behaviours and type of apparatus used, particularly when multiple items are used to simultaneously apply opposing aversive stimuli. Cross-sectional surveys, such as the one used, cannot reliably identify casual relationships. Differences in horse age, sex, learning history, and coping style may influence responses that emerge under saddle. Data on these were not collected by the survey and should be noted as a potential limitation. Careful consideration of the results of this study would allow equestrians to be better informed when selecting apparatus for their horse when undertaking equitation activities. This has the potential to reduce the use of apparatus that potentially compromises horse welfare.

Lay person message: A wide range of equipment is used to control horses. Often various items are used together to influence the horse's behaviour to gain more control and/or better competition results. When multiple pieces of equipment designed to 'manage' the horse's behaviour are used at the same time this can cause serious problems, especially if one piece of equipment is designed for more 'go' and the other for more 'whoa'.

Keywords: equine; conflict; behaviour; welfare; apparatus; tack

LT30

MICRO-BEHAVIOURAL RESPONSES OF HORSES TO FAMILIAR STIMULI PRESENTED BY HUMANS WEARING A MASK: IMPLICATIONS FOR EQUINE CARE DURING THE COVID-19 PANDEMIC

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The SARS-Cov2 pandemic has given rise to a range of changes in human activity and behavior globally. Perhaps the most ubiquitous of which is an increase in the wearing of protective face masks. Given the evidence that horses are sensitive to human facial expressions, the current study aimed to identify any potential impact on equine behavior of occluding facial cues with masks. Micro-behavioural changes (e.g. ear movements, blink rate and non-nutritive oral behaviours) in response to the presentation of various stimuli were recorded. Specifically, the behaviours of stabled horses (n=10) in the presence of a stationary familiar person stood at a distance of 1.5 metres in front of the horse (control condition), were then compared with the same person picking up a saddle, or picking up hair clippers. The behavioural responses displayed by equine subjects in 36 trials (12 per condition) were also compared with responses to the same trials conducted when the human presenter was wearing a mask (in a counterbalanced design). Micro-behavioural data from interval sample coding of video footage revealed several significant interaction effects. Subjects were less likely to have both ears forward in the clippers condition, but only when the clippers were presented by a masked person ($F(1.76,29.84) = 2.77$, $p < .05$). Compared with the control condition, horses were also less likely to spend time with their head facing forwards and more likely to display a right head turn in the clippers condition when a mask was worn ($F(1, 17) = 2.67$, $p < 0.05$). Analysis of event sampling observation also revealed a significant reduction in right eye blinking in the masked clippers presentation ($F(1, 17) = 10.93$, $p < 0.005$). This study suggests that potentially useful insights may be gained from further analysis of this micro-behavioural repertoire as an indicator of equine arousal, and therefore potential stress. If increased mask-wearing persists in light of global changes to public health advice, or future pandemics, then a better understanding of micro-behavioural responses to stimuli in the presence and absence of masks is potentially informative in improving equine welfare.

Lay person message: Horses gain important information from, and respond differentially to, human facial expressions. However, COVID-19 has resulted in requirements to cover faces during many activities. The potential impact on horses of wearing protective masks was explored by close observation of their reactions to familiar stimuli (e.g. a saddle) when held by a person with, and without, a mask on. The observed responses of horses to masks have potential implications for COVID-safety measures during human-horse interactions.

Keywords: COVID-19; masks; behaviour; micro-behaviour; horse-human relationship

LT31

UK HORSE OWNER PERCEPTIONS OF FACTORS IMPACTING EQUINE EMOTIONAL STATE AND BARRIERS TO MAKING POSITIVE WELFARE CHANGES

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Increased public concern within equestrianism has highlighted the need to engage owners with routine welfare appraisal. However, suboptimal welfare practices often continue due to a failure to address human behaviour and proactively identify barriers precluding positive change. A survey, distributed to UK horse owners through equestrian social media groups, aimed to gather information on management practices, equine welfare knowledge and challenges impeding welfare improvements. Findings represent a self-selecting sample and respondents engaged with the topic, so not necessarily representative of wider equestrians. Quantitative data are reported elsewhere, with qualitative results as follows. Respondents identified factors eliciting positive emotions in horses, and four higher order themes were identified from thematic analysis of free-text responses (n=259, several free text comments were allocated to more than one theme): company of conspecifics (53%), natural environment (25%), positive human interactions (22%), and food (22%). Responses regarding situations evoking negative emotions were the opposite: isolation (56%), confinement (52%), negative human interactions (38%), and hunger (33%). However, in contrast to these views, almost half of respondents (48%) said that their horses were kept without company for at least part of the day, 15% of horses were kept alone all the time and a fifth of respondents (20%) deprived their horses of forage for at least part of the day. Barriers or limitations participants felt there were to meeting equine welfare needs were identified and formed four higher-order themes: restricted facilities (55%), outdated attitudes (43%), knowledge deficits (22%) and financial issues (15%). Comments included: *"Too many rules and restrictions on livery yards – you are at the mercy of the yard owner and have no control over management"*; *"Finding a livery yard that offers everything is impossible – it always ends up being a trade-off"; "People's attitudes are out of date and industry standards need an upheaval"* and *"To an extent, equestrian culture makes it difficult and even a stigma to put animal's welfare first"*. For equestrians to engage with welfare and align traditional practices with current research, they must be willing to contemplate the impact that different situations have on equine mental state. However, educating owners is of limited value if they remain unable to overcome other barriers and lasting behavioural change could be hindered by factors outside the control of many equestrians, including livery restrictions and resistance to new ideas. Further research is needed into individual motivations and how opportunities for positive change can be more readily available.

Lay person message: An online survey was conducted amongst horse owners in the UK (n=259) asking them to identify situations which were likely to evoke positive or negative emotions in horses and factors preventing positive change or advancing practices within the equestrian industry. Barriers were identified as restricted availability of appropriate facilities and outdated attitudes resulting in compromised horse-human relationships. These challenges must be addressed, to provide horses with improved Quality of Life and positive emotional experiences.

Keywords: welfare; equine; owner perceptions; emotional state; management

LT32

OPTIMISING HORSE WELFARE: IS BEST PRACTICE REALLY BEST FIT?

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Within the horse industry there is a tangible willingness to improve horse wellbeing. This may be through identification and continuation of elements of traditional practice that facilitate good horse welfare and the cessation of those that do not. In addition, it involves adopting new approaches that research has demonstrated are valuable, particularly those that align with horse ethology (natural behaviour) and cognition (how the horse perceives and experiences its world). Best Practice is a universal approach comprising a set of prescribed practices that have been generally accepted as superior to alternatives either because it produces results that are alleged better than those achieved by other means or simply because it has become a standard way of doing things. However, with the implementation of (so-called) Best Practice to managing and working with horses, the question needs to be 'best for whom'? It may, in reality, be aspirational as opposed to wholly achievable, due to context-specific constraints since every horse owner's and horse's situation is different. Since Equitation Science began it has been widely acknowledged that the integration of evidence-based findings into industry and individual practice can be problematic due to the management of the introduction of change to often well-established and seemingly successful practices (i.e. tradition). A series of social science concepts can be applied to assist with this transition including those related to theories of Human Behaviour Change, Adaptive Management and Moral Reframing. These are based on the understanding that a series of interim steps are critical to achieve the ultimate goal of effective change that leads to optimal equine welfare. A Best Fit approach, defined as an approach to change that reflects sector/discipline practices, is responsive to local contexts, enables rapid local change first and therefore increases the likelihood of positive feedback, is strongly encouraged to avoid the occurrence of restrictive 'industry norms' that arguably deter progress from being made as new findings emerge from contemporary research. It is proposed that Best Fit assessments of horses kept for multiple purposes world-over be conducted. These should focus on pertinent areas that clearly align with the Five Domains (housing, yarding and pasture keeping, nutrition, health and rehabilitation, behaviour, breeding, transport, mental health and other applied working life situations). Implementation of a contingency-based Best Fit approach within the equine industry is arguably more realistic and at the current time better able to promote the engagement that is needed to ultimately achieve optimal equine welfare and quality of life.

Lay person message: There is an increasingly strong desire amongst horse practitioners who are responsible for the management and training of horses to do this as well as possible in order to promote good welfare practices. It is necessary to apply a Best Fit approach to bring about context-specific meaningful changes that will positively improve horse welfare and quality of life**.**

Keywords: horse; welfare; Best Practice; Best Fit; change; management

LT33

DOES THE START OF FLAT RACES INFLUENCE RACEHORSE RACE PERFORMANCE?

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The start of flat races is thought to affect the subsequent performance of racehorses. This study evaluated the impact of time spent inside the starting stalls, horse and jockey behaviour during race preliminaries, and loading on racehorse performance. Pre-recorded race footage for 546 horses across eight race days at Chelmsford City racecourse was assessed. Time horses spent inside starting stalls, loading aids used and jockey behaviours were noted, and notational analysis measured how much horses sweated and their behaviour before, during and after loading. Racehorse behaviour was categorised using an ethogram adapted from previous conflict behaviour research. Kruskal-Wallis and Mann Whitney U analyses identified if differences in behavioural, sweating, jockey behaviour and loading aid variables affected finishing position. Binary logistic regression models (win vs. did not win; placed vs. did not place) tested if the variables measured affected performance. Racehorses that spent <50 seconds inside the starting stalls were more likely to win ($p<0.05$) and place ($p<0.01$). Those showing moderate adverse behaviour before loading ($p<0.01$) and no adverse behaviour inside stalls ($p<0.05$) were more likely to win and place, although behaviour during loading had no significant effect. Horses foaming ($p<0.01$) and requiring specialist loaders ($p<0.05$) were more likely to win, although other loading aids did not significantly affect performance. Jockeys that pushed their bodyweight forwards in the saddle during loading were more likely to place 1^{st}-4^{th} ($p<0.05$). The chance of placing was reduced by 15% for every increase in drawn order ($p<0.01$; CI:0.77-0.96) and by 59% when racehorses spent >50 seconds inside the stalls ($p<0.05$; CI:0.19-0.92). The chance of placing was also decreased by 13% for every increased year of age ($p<0.05$; CI:0.78-0.97) and by 17% for each additional horse in the field ($p<0.001$; CI:0.00-0.83). Adverse behaviour inside the stalls reduced racehorses' chance of placing by 52% ($p<0.05$; CI:0.00-0.48). These results demonstrate that the start of flat races can affect racehorse performance and highlight the importance of warm-up protocols to minimise warm-up intervals and gate training to maximise racehorse performance.

Lay person message: The start of flat races has long been thought to affect racehorse performance. The results suggest this assumption has some credence; horses that spent less time inside the stalls, used a specialist loader or showed no or moderate adverse responses to loading were more likely to win races. Racehorse training should include loading preparation and time spent within the stalls should be limited to stop horses from being unfairly disadvantaged before races.

Keywords: flat horseracing; performance; starting stalls; behaviour; thoroughbred; racehorse

DAY 3 THEME 4: TRAINING FOR EDUCATION

PL4

LEADING THE CHANGE - A NEW ERA FOR PONY CLUB EDUCATION

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The scientific perspective of horse-human interactions illuminates the associated learning processes and offers potential for optimal management through highlighting the horse's fundamental needs. In particular, the advent of equitation science within the past two decades offers the dual promise of optimising both training efficiency and welfare at the practical level of horsemanship throughout the world. Despite this potential, the uptake of equitation science has been slow in the general horse world, largely owing to the traditional origins of horsemanship and the subsequent anthropomorphism that has been accentuated by the horse's iconic status throughout the millennia. The narratives of loyalty, benevolence, work ethic and the 'will to win' have nourished the traditional approaches which have stood firm against the backdrop of significant safety issues, welfare issues and behaviour problems.

PCA (Pony Club Australia) is the second largest pony club organisation in the world with over 40,000 members and like its associated counterparts across the globe, its coaching was informed by a traditional syllabus that became increasingly out of step with the recent advances in our understanding of equine learning processes and ethology. I became a director on the board of PCA in 2016, and my aim, in concert with that of the PCA board was to modernise pony club in its syllabus of instruction, and in this way to positively contribute to the organisation that gave me great pleasure and such a good start in my equestrian life. In this presentation, I discuss the shift in the syllabus to a modern understanding of horse-human interactions, and the obstacles that stood in our way as well as the encouragement and assistance that enabled change to begin. Modernising the syllabus necessarily also included the contemporary imperatives of inclusivity and diversity which are essential components for sustainability. In this light, PCA determined to broaden its horse-sport focus beyond the exclusive focus of the three Olympic disciplines, to include all horse sports and activities and to equally benefit those children who may choose to become expert in the theoretical elements of equitation science, embodied in what is known as the pony club 'quiz' competition. In addition, the new coaching approach accounts for those children who simply want to improve their connection with horses without any particular goal in mind.

Of course, change is rarely straightforward, and there have been significant challenges in implementing the new syllabus, notwithstanding the inhibiting effects of the COVID-19. This pandemic curtailed many of the proposed practical demonstrations of the syllabus via workshops throughout the 6 Australian states and the Northern Territory during 2020 and 2021. Regardless, much of the challenge posed by the new syllabus concerned the fear and suspicion of change to a traditional system that on the surface, appeared viable. Social science reveals that implementing change typically involves various stages before acceptance. These stages may include opposition, frustration and apathy. Leverage however can be achieved by engaging with the mindset that much of the practical application of the information in the revised syllabus is not necessarily new and indeed the goals of horse training and equestrian pedagogy have not changed so much as they have deepened, broadened and made more accessible. In terms of management and welfare, the modernised approach is simply about teaching people to be able to 'think like a horse' and

understand the horse's learning processes and basic needs. There are many strategies to encourage people to adopt new mindsets and to embrace different practices. The exploration of these techniques at both the National Federation level and the individual level are described in this plenary and are referenced with examples from practical experience in the equestrian education domain as well as experiences in the elephant training world.

RP16

INVESTIGATING A MEANS OF IMPROVING STUDENT ATTITUDE AND COMPASSION TOWARDS EQUIDAE ON ANIMAL MANAGEMENT COURSES

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Studies have shown that people's attitude can impact animal welfare, and that attitude can be changed; however, there is little research into attitude/compassion towards specific species, particularly donkeys. A positive attitude towards donkeys has the potential to influence the welfare of these animals at around 84 educational establishments, many using donkeys as large animal subjects, and is pertinent for students considering careers with *Equidae*. We aimed to test an online learning package to determine if animal management and equine students' attitude/compassion towards, and knowledge of, donkeys could be improved. We also compared differences between two scales of measurement. Both intervention and control groups answered a questionnaire assessing attitudes and compassion towards donkeys (based on a new Brooke attitude scale and an adapted Sussex-Oxford Compassion scale). The intervention group then completed four sections of instructional material (covering donkey behaviour; physiology and ethology; sentience and welfare and the need for compassionate handling) with quizzes in each section testing knowledge. The control group completed the quizzes only, allowing comparison of knowledge levels between intervention and control groups. Both groups then completed the initial questionnaire again. There were 18 valid responses: eight intervention and nine control for attitude assessment and seven intervention, 11 control for knowledge assessment. Data were analysed using a General Linear Model (GLM) with post hoc comparisons. Significant differences were found in before/after overall attitude percentage scores ($F(1, 63) = 5.12$, $p = .028$; n=32, M=87.33 SEM±1.66 before, M=92.68 SEM±1.72 after) and results approaching significance for intervention/control and Brooke/Sussex Oxford scales (both $p = .07$; M=92.19 SEM±1.42/M=87.82 SEM±1.96 and M=92.18 SEM±1.63/M=87.83 SEM±1.79 respectively). No significant difference was found between intervention and control groups for overall level of knowledge ($p = .112$). Significant difference was found overall by section ($F(3,67) = 4.03$, $p = .011$), with the mean score for sentience and welfare (M=0.95 SEM±0.03) significantly higher than those for behaviour (M=0.76 SEM±0.02) or need for compassionate handling (M=0.78 SEM±0.07). In conclusion, students' attitudes and compassion towards donkeys can be positively affected with a short intervention and it is possible that simply answering a range of donkey-related questions has impact. The next step is to conduct a larger study, followed by measurement of any impact on behaviour towards donkeys, and finally whether the attitude change is maintained over time.

Lay person message: A short online programme including donkey behaviour, sentience and the need for compassionate handling can positively influence the attitude of students towards donkeys. Simply answering a range of donkey-related questions may have impact. An improved attitude towards donkeys has the potential to improve the welfare of these animals at many educational establishments using donkeys as part of their teaching syllabus; it is particularly important for students considering a career involving these animals.

Keywords: donkey; students; attitude; compassion; educational intervention

RP17

THE EFFECT OF WEARING A HEADCOLLAR OR BRIDLE ON THE SCORING OF HORSES (*EQUUS CABALLUS)* USING THE HORSE GRIMACE SCALE

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The identification of pain in horses can improve welfare and offer solutions to both physiological and psychological problems currently unidentified or potentially misunderstood in horses. Minimising pain and discomfort in horses used by humans is fundamental to retain a social license to operate for the equine industry. Although extensive research into facial expressions has allowed a greater understanding of pain in horses, assessment is invariably conducted in a controlled environment using images of horses without headgear, which could potentially limit its use. To validate the use of the Horse Grimace Scale (HGS), composed of six facial action units (FAU) in alternative environments, this study assessed the impact the horse's usual headgear has on the HGS scores. Forty participants, 20 with horse experience and 20 without horse experience scored a nearside photo of 10 horses in three different conditions (no headgear, headcollar and bitted bridle, always in this order) by comparing the pictures against the HGS of horses, which is currently used without headgear. A Friedman test showed that wearing headgear does influence the scoring system of the HGS for the accumulated total score (χ^2=29.245, df=2, p<0.001) and for five of the six FAUs (FAU4 Prominent Strained Chewing Muscles not significantly different). Post-hoc Wilcoxon tests showed that headcollar and bridle did not differ, but both differed from no headgear, both for the accumulated total score (headcollar W=-4.67, p<0.001; bridle W=-4.47, p<0.001) and four of the five tested FAUs (FAU1 Stiffly Back Ears: headcollar and bridle also showed a significant difference). There is no significant difference between the scoring of participants with horse experience and those without horse experience, both for the accumulated total score (Mann-Whitney U test; U=249, p=0.192) and for each FAU separately. Detailed analysis of the photos seemed to indicate that the HGS scores were higher with headgear than without, suggesting that the facial expressions of the horses depend on the presence of headgear. Further research is needed to ascertain whether that change in facial expression indicates the anticipation of discomfort. The absence of a difference between participants with and without horse experience suggest that no extensive training in the use of the HGS or actual experience in working with horses is required to use the HGS. However, further validation of the generalised use of the HGS would require further studies using larger sample sizes to determine what variables influence the scores under which circumstances.

Lay person message: The Horse Grimace Scale (HGS) is a pain coding system used to identify pain in equines. This study evaluated the effect on the score when horses wear a headcollar or a bridle. Headgear influences the HGS scores, but this seems to reflect actual changes in the horses' facial expressions and not just biased scoring by participants. Survey participants with and without horse experience showed no difference in scores.

Keywords: Horse Grimace Scale; facial expressions; equine welfare; headcollar; bitted bridle

RP18

THE RELATIONSHIP BETWEEN UK EQUESTRIANS' SELF-PERCEIVED AND TESTED LEVEL OF UNDERSTANDING AND APPLICATION OF EQUINE LEARNING THEORY

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Previous literature has highlighted the importance of the correct application of equine learning theory (ELT) principles during horse training and behaviour modification; with skilled application leading to improved behaviour and welfare. This study investigated whether there was an association between the level of education, experience and perceived learning theory knowledge levels (via self-scoring) of Equestrians and their actual knowledge and correct application of ELT (via online test questions and scenario presentation). Participants (n=122) predominantly from within the UK equestrian community via an online questionnaire distributed through equestrian social media platforms. Results indicated that Qualification Level and Level of equestrianism were significant predictors of Actual overall Theoretical and Practical ELT Score (multiple regression, Qualification Level, Level of equestrianism $p<0.05$, $R^2 = 17.60\%$). There was a moderately significant positive correlation between the equestrians' perceived theoretical knowledge and their actual theoretical knowledge score assessed via equine learning theory test (Spearman Rank Correlation, $r_s = 0.519$, $N = 122$, $p < 0.05$) but interestingly no significant correlation was found between the equestrian's perceived practical ability and their practical ability scores (Spearman Rank Correlation, $r_s = 0.004$, $N = 122$, $p>0.05$). When considering the individual quadrants of ELT, the equestrians' perceived that they had a greater understanding of positive and negative reinforcement compared with positive and negative punishment and levels of understanding were perceived to be different between quadrants (Kruskal-Wallis, $H_2 = 11.12$, $p<0.05$). Similarly, the actual scores for levels of understanding of equine learning theory quadrants were significantly different (Kruskal-Wallis, $H_2 = 39.81$, $p<0.001$) with actual knowledge of positive reinforcement and negative punishment scoring higher overall marks than negative reinforcement and positive punishment in terms of the equestrians' understanding of the terms. There was no statistically significant difference between the actual combined knowledge score for Professional and Non-professional equestrians (Mann-Whitney U test: $W = 1997.00$, $N=37,85$, $p>0.05$). However, the median actual combined knowledge score for Professional equestrians (median = 7) was lower than that of Non-professionals (median = 8). There remains a significant unmet requirement to address issues around equestrians' erroneous assessment of their training knowledge and capabilities. This could be addressed through an educational strategy to develop equestrians' theoretical knowledge and practical application of ELT to improve equine training efficacy, reduce behavioural wastage and promote equine welfare.

Lay person message: Within the equestrian community there remains huge variation in the level of understanding of equine learning theory. Level of experience or qualification does not necessarily predict a greater level of knowledge of equine learning theory or its application. Many equestrians perceived their level of knowledge and application of learning theory differently to their actual knowledge and decision making when tested. Therefore, incorrect equine training practices may be undertaken, negatively impacting both behaviour and welfare.

Keywords: equine; learning; training; welfare; behaviour; knowledge

RP19

A LISTENER ANALYSIS OF AN EQUINE SCIENCE-BASED PODCAST, WHOSE AIM IS TO BRIDGE THE GAP BETWEEN SCIENTISTS AND HORSE ENTHUSIASTS FOR KNOWLEDGE TRANSFER AND IMPROVED WELFARE

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Podcasts have become a popular digital forum for discussing scientific information with peers, as well as the non-scientific community. The COVID-19 pandemic resulted in a new wave of podcasts launched during global lockdowns. In 2018, pre-COVID, Apple reported 500,000 active podcasts. Currently in 2021 Apple claims there are over 2 million podcasts with 48 million episodes. However, with this increase, evidence-based empirical studies are still lacking that reflect listener demographics of specific podcasts. In this study, we aim to analyse the demographics of the listenership of an equine science research driven podcast to get an understanding of what may influence people to listen to current evidence-based research. The podcast "Conversations in Equine Science" (CES) hosted by Anchor was launched in June 2020. Each episode delves into research driven discussions about equitation science, equine nutrition, physiology and behaviour as it applies to horse welfare. Social science for humans, as it affects human-horse relationships, is also a popular discourse. If podcast statistics are correct, podcasting may be a valuable method of knowledge transfer between formal academic communities to their students and the general public. The CES listener demographics of country (45), age (67% of listeners are between 23 and 44 years of age), gender (89% female), and listener engagement (>7,000 plays) were analysed along with episode subject, frequency, and length. These were then compared to complete and partial listens for each episode. The findings are encouraging as they reflect entertainment-based podcast statistics. Podcasts are an easy access, low-cost medium to convey research and current trends in the equine/equitation science genre. Traditionally, horse management hasn't considered the science based ethological needs of the horse. The aim of the CES podcast is to engage and motivate listeners to investigate research driven equine management practices to encourage changes to improve horse welfare. One aspect of this analysis reveals that podcasting can be a useful format to bridge academic research with the everyday horse keeping community, when episodes are presented in a conversational dialogue, and in short (< 25 minutes) consistent (weekly) segments.

Lay person message: This study analysed the demographics, provided by the Apple/Anchor Podcasting Platform, of a specific equine research driven podcast, over the course of a year (52 episodes). This analysis determined key characteristics that appear to foster scientific engagement with the general equine community of listeners. The objective is to use these data effectively to advance equestrian practice and improve equine quality of life.

Keywords: equine science; podcast; lay public; equine welfare; research; communication

RP20

THE USEFULNESS OF BLINDFOLDING HORSES AS A HANDLING METHOD

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Blindfolding horses reduces visual stimulation and is purported to make a horse more manageable, such as when evacuating from a burning barn. No research has quantified the usefulness of this technique. We hypothesized that blindfolding would increase the time taken to lead a horse from their stall and through an obstacle course and that handler inexperience would increase handling time even more. In Test 1, 31 horses were led from their stall by either an experienced or inexperienced handler in both the blindfolded and unblindfolded condition. In Test 2, 28 horses were led both blindfolded and unblindfolded through an obstacle course consisting of weaving through cones, backing through a channel, walking over a tarp, and walking through a narrow gate that brushed their flanks. For both tests, horses wore a heart rate (HR) monitor and a tensiometer on the lead rope to measure pressure exerted while leading. Time taken to complete the tests was recorded along with active and passive resistance behaviours (i.e. moving away or balking). A mixed model for repeated measures analyzed the main effects of treatment and handler on HR, lead rope tension, time taken and resistance behaviours. In Test 1, the inexperienced handler took longer to halter (24.77±1.63s; $F_{1,27} = 31.95$, $p < 0.0001$) and blindfold (27.73±3.38s; $F_{1,27}=15.53$, $p=0.0005$) the horse compared to the experienced handler (11.78±1.60s and 8.50±3.27s respectively). Regardless of handler, compared to the unblindfolded horse, the blindfolded horse took longer to lead (10.48 ± 2.15s vs. 36.03 ± 2.15s respectively; $F_{1,27}=70.26$, $p<0.0001$), required greater pressure (1.4kg vs. 7.4kg respectively; $F_{1,24}=66.51$, $p<0.0001$) and increased HR by 10bpm ($F_{1,27}=14.04$, $p=0.0009$). In Test 2, blindfolded horses took longer to navigate the cones ($F_{1,22}=51.51$, $p<0.0001$), the gate ($F_{1,22}=9.95$, $p=0.0046$) and backing up ($F_{1,22}=10.13$, $p=0.0043$) but took less time than unblindfolded horses to cross the tarp ($F_{1,22}=1.17$, $p=0.29$). Horse HR was higher the first time they navigated the obstacle course regardless of treatment ($F_{1,20}=9.36$, $p=0.0062$). Horses balked more when unblindfolded ($F_{1,22}=13.71$, $p=0.0012$) but displayed more active refusal when blindfolded ($F_{1,22}=4.47$, $p=0.0462$). These results show that blindfolding increases handling time and active refusal by the horse.

Lay person message: Blindfolding horses to lead them from burning buildings is idealized in movies but there is no empirical evidence supporting the practice. Our results showed that it takes more time for inexperienced handlers to halter and blindfold a horse and blindfolded horses took longer to navigate an obstacle course, thus, blindfolding the horse may not be the best option if time is critical.

Keywords: obstacle course; handler experience; lead rope tension; heart rate; behaviour

K4

HARNESSING THE POWER OF EDUCATION FOR ADVANCING EQUINE WELFARE

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There has been much debate surrounding the ethical use of the horse in sport and recreation. The impact of training, competitive demands and management practices have been evaluated to differing extents with the focus of many studies being on technological advances to measure the physical impact of specific pieces of equipment, inputs related to the rider's actions and training methods. By comparison there has been less focus on the way the horse experiences the training situation, and also how new scientifically validated information influences the human-horse interaction. Advancing equine welfare often challenges current thinking and practices that are considered to be normal and acceptable. This relies on human behaviour change, and requires an understanding of the barriers to information uptake, as well as considering the most effective way to positively engage with horse owners and practitioners. Evidence-based Education is generally considered to be a key catalyst and driver for change, however how effective this is relies upon the knowledge delivered being robust, relevant and accessible. There has been slow and steady progress with the growth of Tertiary level educational programmes that either fully or partially address the new transdisciplinary area of Equitation Science. Initially the approach was through embedding equitation science material or new courses into existing programmes of study such as equine science, but more recently there has been a growth in Equitation Science Postgraduate taught and research programmes. Whilst this is a positive outcome, this may not address the issue of how to improve understanding of equine learning and behavourial needs amongst the many existing and new equine owners and trainers who may not see the need to change their way of training and managing the horse.

Since the first formal international symposium in 2005, Equitation Scientists and emerging practitioners have focussed strongly on improving our understanding of equine learning so as to be able to train more effectively, ethically and sustainably. The research and emerging improved practice that has resulted from this growing awareness within the horse owning population, has demonstrated that clarity of signals/cues/aids and delivery of reinforcement in response to desired behaviour performed by the horse, are essential as together these promote effective learning with minimum stress. The culmination of research conducted over the past two decades has undoubtably led to improved understanding of horse-human interactions, particularly those associated with horse training, whether for husbandry or performance related purposes. With rising concerns regarding welfare concerns related to the use of equids/horses for sport and recreation, and public 'Social Licence to Operate', particularly with regards to industries that 'use' or 'produce' animals, it is essential that scientific findings are communciated comprehensively in an accessible way, to reach horse owners/carers/riders. This has been appreciated by organisations such as the International Society for Equitation Science who over the past two decades has hosted 17 international conferences at which hundreds of oral abd poster presentations have been given, that include a 'lay person message' within the more formal scientific abstracts. Whilst these summaries written in every-day language enable key mesages and findings to be effectively relayed to those directly and

indirectly responsible for horses, it is not clear how widely they are taken up and what impact they have in relation to improving understanding and practices.

There is considerable benefit to improving our understanding of what horses need from humans to live a good life. However there is also an urgent need to address how we effectively disseminate new knowledge that may challenge current practices to ensure that we change human attitudes and practices for the better.

Lay person message: Changing human behaviour to improve equine quality of life relies on an understanding of what underpins current human attitudes, behaviour and practices amongst the horse owning public, and how to change these effectively to benefit the horse. Relevant, accessible and best evidence-based education is considered to be a driver for change, yet this has not as yet been a focus of work of equitation scientists. We argue that to advance equine welfare we need to not only understand the world from the horses' point of view, but also what drives the human part of the dyad. We advocate the need for equitation science to encourage more research in this domain, so that we can more effectively harness the power of evidence-based education to shift the baseline of what has become normalised, to a new evidence-based approach to interactions with horses in training and performance.

Keywords: equine; evidence-based; human behaviour change; welfare; education

LT34

WHY THE HECK IS MY HORSE ERECT? THE INVESTIGATION OF DROPPING BEHAVIOR IN MALE HORSES DURING TRAINING

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Horse trainers, in particular positive reinforcement trainers (PRT; i.e. clicker training) have noted dropping (penile tumescence) occurring during training sessions. Trainers vary on how they interpret dropping, from a sign of relaxation to a sign of frustration and aggression, which can lead to misinterpretation and inappropriate use of management strategies. The objective of this study was to collect data on the frequency of dropping, how dropping is interpreted and managed by trainers, and if dropping behaviour is displayed more often during clicker training. Trainers completed an online survey gathering data on trainer and horse demographics, training methods and details and beliefs on dropping. Participants (n=244) were spread across North and South America, Australia, Africa and Europe, mainly female (90%), aged 18-29 (28%) and had >10 years experience working with horses (78%). Descriptive statistics showed dropping was variable, ranging from not dropping during training (26%), dropping once briefly (15%), dropping for short repeated bouts (25%), staying dropped (14%) for the majority of the session, or some other combination (20%). The majority of participants talk to their horse during training (98%) and use treats (72%) and scratches (81%) as rewards. Trainers reported that dropping does not generally occur when training for a specific behaviour (72%). Chi-squared analysis suggests that training style did influence dropping (X^2 (df=12, n=138)=31.76, p=0.0015), with dropping occurring most often during PRT (32.5%) and PRT combined with another training style (22%). PRT horses most often displayed dropping for the entire session (63%). In contrast, horses trained using natural horsemanship (50%) or traditional (54%) styles did not drop. Dropping occurred more often when treats were involved (X^2 (df=4, n=139) =20.01, p=0.0005). Trainers reported that they mostly ignored dropping (61%) and did not believe that dropping was a problem (64%). Qualitative analysis of an open-ended question showed that trainers attributed dropping to relaxation (48 references), enjoyment (35 references), frustration (27 references) or food rewards (23 references) by the horse.

Lay person message: Clicker trainers have noticed dropping occurring within their training sessions and preliminary survey results show that dropping happens more with this training style than traditional methods. Dropping is more frequent when treats are involved. Trainers interpret dropping as a sign of relaxation, frustration or enjoyment and often ignore it. Understanding dropping can lend insight to the horse's affective state.

Keywords: penile tumescence; positive reinforcement training; clicker training; natural horsemanship; traditional training

LT35

SET IN STONE: HOW IS RIDDEN HORSE WELFARE DEPICTED IN EQUESTRIAN STATUES THROUGHOUT TIME AND CULTURES?

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Equestrian statues provide an interesting sample set to assess portrayal of ridden horses across different epochs and cultures, and presuming that horses in these statues can be considered to reflect an ideal of that epoch, they can give a hint on welfare levels of horses in that time. With this study, we aimed at assessing the welfare of horses using equestrian statues and different indicators (i.e. angles of mouth, neck position, rider (length from foot to head) to horse (withers height) ratio, tack). Four coders analysed photographs of equestrian statues (N=210; inter-coder-reliability: all ICC>0.75) from a publicly available, global database. The portrayed riders lived from 1AD up to 2017. Rider-horse height ratios generally gave little rise to concern of too heavy riders for the horses (1.08±0.14; mean±SD). The majority of horses and riders (67%) were depicted with additional equipment items (e.g., nose band (58%), spurs (55%), curb chains (33%), auxiliary reins (7%), whips (2%)). Mean mouth-opening was 22.27±16.83° (greater angles=greater mouth-opening) and the majority of horses were depicted with flared nostrils (60%), indicating agitation/stress. Measurements of the neck angles revealed extreme neck flexions (cranio-facial-profile ('noseline')-neck angle: 83.07°±28.99, noseline-vertical angle: -33.02°±25.90, neck-horizontal angle: 49.93°±25.97). The more recent the statues, the more additional equipment was visible ($r_{spearman}$=0.33, N=210, p=0.01). And mouth-opening correlated positively with flared nostrils ($r_{spearman}$=0.38, N=210, p<0.01). Independent of the statues' date of completion (ANOVA: p=0.545), the more recent the epoch the horse lived in, the larger was the mouth-opening (GLM: -0.01±0.01, t=-2.17, p=0.031). The noseline-neck angle was negatively influenced by the mouth angle (GLM: -0.182±0.09, t=-2.07, p=0.04) and number of additional equipment items (GLM: -4.26±2.08, t=2.05, p=0.04). Ancient statues tended to depict smaller noseline-neck angles (GLM: -0.02±0.01, t=-1.88, p=0.06). Interestingly, statues in countries of Eastern Europe (GLM: -9.72±4.92, t=-1.98, p=0.05) and South America (GLM: -18.83±7.20, t=-2.62, p=0.01) depicted horses with a smaller noseline-neck angle compared to statues in Western Europe. Neither rider gender nor status related to the measured angles (all p>0.05). In conclusion, equestrian statues often portray horses in an agitated/stressed state with postures compromising horse welfare. While some aspects such as an extreme neck flexion seem to have declined in severity over the centuries, this also seems to be culturally dependent, and contemporary statues still give rise to welfare concerns. Statues might contribute to manifestation of an image of ridden horses that entails considerable welfare concerns, if riders transfer this ideal to present-day equestrian activities.

Lay person message: Equestrian statues throughout the world typically depict horses that show signs of stress and compromised welfare. While postures indicative of compromised welfare slightly improved over time, an increase in additional tack with potential to increase rider forces can be observed. Since equestrian statues might contribute to manifestation of an ideal image of ridden horses that may be transferred into practice, these findings give rise to welfare concerns.

Keywords: welfare; equestrian statues; neck flexion; discomfort behaviour; history; equipment

LT36

THE EFFECT OF ELASTIC REINS ON REIN TENSION AND PERFORMANCE IN DRESSAGE HORSES

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Many interactions between horses and humans are mediated through some form of physical equipment, particularly when riding. Multiple styles of reins constructed with elastic inserts are available for purchase with the promise that they will help dressage riders develop a light, steady and 'elastic' rein contact for the betterment of both their scores in competition and their horse's wellbeing. Although studies have investigated various aspects of elastic reins, results have been inconclusive with regards to their effect on equine welfare. This study examined the effect of elasticated reins on rein tension. Using a crossover design with an overnight washout period, 10 dressage horses (5 mares and 5 geldings, 13.1±2.72 years, all USEF 1st level and above, and their usual riders, bridles and snaffle bits, performed a standardized dressage test using leather reins and reins with built-in elastic inserts. Horses were randomly allocated to group 1 (elasticated then leather) or group 2 (leather then elasticated). Riders self-reported characteristics of their horse's contact (lightness/consistency/responsiveness) prior to data collection. Rein tension (N) was recorded using strain-gauge transducers and the mean, maximum and minimum tensions and the coefficient of variation, as a measurement of rein tension stability, were assessed as potential indicators of impact on equine welfare and performance. Horse-rider dyad performance was both self-assessed by the riders and independently by a dressage judge blinded to rein type who scored both tests. Although no overall statistical differences were found in rein tension or performance measures (rein contact consistency, weight of rein, responsiveness) between elasticated and non-elasticated reins (all $P>0.05$), there were clear indications that this depends on the individual horse, rein tension stability CVs 59.8-118.8). Horse 'rideability' is often described in terms of responsivity to the rein; a 'hard-mouthed' horse is generally non-responsive or responds in an unwanted manner, whilst a 'soft-mouthed' horse is responsive. Analysis of rein tension measures indicates that whilst riding 'hard-mouthed' horses in elasticated reins may be detrimental due to difficulty in achieving a consistent contact, riding 'soft-mouthed' horses in elasticated reins may be beneficial due to improved ability to respond consistently (all t, $p<0.05$). The success of elastic reins may depend on individual attributes of the horse, learnt or otherwise, such as whether the horse is 'hard-mouthed' or 'soft-mouthed'. This study confirms that the application of specific equipment, even that designed to promote better welfare outcomes for the horse, needs to be considered on an individual horse basis.

Lay person message: Reins incorporating elastic inserts are marketed as a tool to achieving an aspirational soft, 'elastic' connection ('contact') between riders and their horses. Rein tension measurements demonstrate that elastic reins work better with 'soft-mouthed' horses than with 'hard-mouthed' horses who find it even more difficult to achieve a consistent contact than with rigid leather reins. It is critically important to understand individual horse characteristics when choosing equipment if their welfare is to be safeguarded.

Keywords: Rein tension; elastic; hard or soft mouthed; performance; dressage score; welfare

LT37

RETRAINING OF RACEHORSES: ATTRIBUTES ASSOCIATED WITH SUCCESSFUL POST-RACING CAREERS

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The racing careers of thoroughbreds are short and facilitate potential post-retirement second careers in alternative equestrian disciplines subject to individual horses' suitability for these. A range of organisations specialise in racehorse rehoming such as Retraining of Racehorses (RoR) supported by industry initiatives to safeguard racehorse welfare for the duration of a horse's lifetime. Despite this, few studies have empirically evaluated if key attributes influence the success of former racehorses in their second careers. A 31-question online survey was distributed via RoR and targeted equestrian social media to former racehorse owners to ascertain behavioural and physical attributes they felt influenced successful second careers. Frequency and thematic analysis identified respondents believed former racehorses were very trainable, social, inquisitive and quick to learn, and could excel in any discipline. Survey findings informed 20 semi-structured interviews, with recreational and competitive owners to explore key attributes linked to success in more detail. Five key areas emerged from thematic analysis: horse-human partnership, discipline suitability, RoR community and financial stability. Owners consistently reported that the bond or "*love*" that they felt towards their former racehorses was the key factor that influenced a positive second career. Racehorses athleticism, trainability, strong hindlimbs and responsiveness to the rider were associated with competitive success, however the need to allow horses to "*progress at their own pace*" and to adapt to their individual "*quirks"* during training was reinforced. RoR was celebrated for creating a sense of community and educational support. Owners also highlighted that former racehorses should not be considered a budget route into horse ownership. These results provide an initial insight into the attributes former racehorse owners identify as key to horses' successful transition into second careers and could support industry initiatives in this field. However, it should be noted that all respondents here reported a positive relationship with their former racehorse. Therefore, further studies evaluating unsuccessful relationships are needed to inform methods to achieve optimal horse-human matching and facilitate successful second careers for racehorses.

Lay person message: Racehorse welfare, throughout their career in racing and beyond, is an important component of British Racing's commitment to safeguard lifelong racehorse welfare. Former racehorse owners identified successful second careers were founded on a positive bond with their horse, and felt horses' personality, athleticism and trainability informed successful transitions into recreational and competitive homes, if owners were willing to adapt to horses' individual quirks. Understanding which attributes inform horse-human relationships could promote increased successful racehorse rehoming.

Keywords: racehorse welfare; Thoroughbreds; horse-human bond

LT38

A STUDY TO INVESTIGATE THE USE OF SIDE-REINS IN LUNGED HORSES

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Side-reins are a popular training aid used by equestrians to encourage flexion in the neck and back, softness in the horse's mouth; and to mimic rider contact. There is no compelling research on how side-reins affect the horse (both physiologically and psychologically) and whether, subsequently, this compromises equine health and welfare. A survey collected data to investigate equestrians' rationale for the lunging of horses, whether they lunge their horses using side-reins, their reasons for doing so, how they learnt to use side-reins and the behavioural outputs of their horses whilst being lunged with and without side-reins. Respondents (n=141) identified that, of those who lunged their horses (93%), 40% used side-reins whilst the remaining 60% did not. Those that did not use side-reins chose not to predominantly because they used another item instead (34%) or because their horse worked well without them (35%). Respondents that used side-reins did so to encourage a consistent and steady outline (26%), improve suppleness through the back (19%), develop top line muscle (18%), establish initial contact with a young horse (18%) and establish acceptance of a contact (17%). 44% of respondents lunged 1-2 times a week, 22% lunging occasionally and 21% lunging rarely. The remaining 13% of respondents lunged daily or 3-4 times a week. 56% of respondents lunged to develop balance, strength and suppleness, 48% lunged for exercise and 40% lunged for time convenience. 52% of respondents learnt to use side-reins informally (self-taught or taught by a family member/friend) and 26% of respondents were formally taught (college, university, riding club and school). Respondents reported reduced incidence of unwanted behaviours such as bucking, rearing, spooking and head tossing during side-rein use with maintenance of other behaviours such as tail swishing and flattening of the ears (Wilcoxon signed-rank test: Wilcoxon statistics= 40.00, n= 9, $p<0.05$). These results indicate that there are wide-ranging levels of understanding around lunging of horses with various reasons presented by equestrians for its use. The use of side-reins within the equestrian community is varied with a significant proportion utilising alternative pieces of equipment during lunging. Respondents reported identifying fewer overt negative behavioural responses in horses lunged with side-reins however, more subtle behavioural indicators of negative emotional state were present. This may indicate that horses lunged with side-reins are less able to perform a wide range of communicative behaviours due to their restricted movement, leaving only the more subtle behavioural indicators on display.

Layperson message: Lunging of horses is common but can bring with it significant dangers to both handler and horse. Conversely there are advantages to well-performed lunging where the equipment and methods utilised comply with equine learning theory and enhance both physical and mental welfare. This study identified interesting owner-reported behaviour changes in horses lunged with and without side-reins including stifling of more overt behavioural responses alongside maintenance of subtle negative behavioural indicators. This could adversely affect welfare and safety if subtle equine body language cues remain unidentified or unaddressed by the handler throughout the process.

Keywords: equine; lunging; side-reins; welfare; behaviour; handling

LT39

A MULTIPLE CORRESPONDENCE ANALYSIS ON THE FEEDING AND MANAGEMENT PRACTICES OF AUSTRALIAN HORSE OWNERS

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This study aimed to investigate the current feeding and pasture management practices of Australian horse owners. An online survey of 4512 horse owners was conducted from July to August in 2017, seeking information on participant demographics, horse demographics, current feed rations, management practices and pasture conditions. Participants were female (95%), and lived on the East coast of Australia (83.3%). Most horses (80%) grazed on pasture with ≥75% ground cover and 90% of horses were fed daily in addition to grazing access. The majority of horses were mature horses (2.5-20 years aged, n=2797). To better graphically visualize, describe and cluster participant feeding and management practices a multiple correspondence analysis (MCA) was performed on the owners of mature horses. The MCA analysis assigns weights to variables creating a pointcloud of data; within the cloud, clusters represent a group of participants engaging in similar practices. The analysis revealed four clusters, using MCA active variables of body condition score, workload, stabling, pasture management and ration digestible energy (DE). Supplementary quantitative variables were participant location, years of experience, industry involvement, sources of information on feeding, how participants measured feed, and horse demographics. The supplementary qualitative variable was participant age. The MCA was conducted in R using the packages FactoMineR and factoextra. The first cluster (n=2012) included participants from Victoria who were non-competitive riders, whose horses were not in work, kept on 'horse sick' pasture with >75% ground cover, and receiving supplementary rations. Cluster two (n= 516) included competitive riders, whose horses were stabled for part of the day and given intermittent access to pasture when not stabled; pasture was short, with <25% ground cover. Horses were Warmblood and in moderate work (180-240 minutes work/week). Cluster three (n= 191) was composed of participants that did not respond to the all the survey questions resulting in a NA value for the MCA, highlighting the difficultly of conducting survey research. Cluster four (n=78) was constructed of participants from South Australia, who kept their horses stabled with no pasture access. Horses were fed above the NRC (2007) DE recommendation and feed was measured with a container of a known quantity. The MCA was used to detect and represent underlying patterns in the data set that were not elucidated through the application of standard statistics. The clustering reveals that within Australia horse management varies greatly depending on where horse owners live, the horse's workload and how those horses are managed. The clusters identified from the MCA could be used for targeted education and resources for horse owners on equine nutrition and pasture management or as a guide for directing future research.

Lay person message: The goal of this analysis was to identify groups of owners according to how they managed and fed their horses. The results found 4 distinct clusters of horse owners, each characterized by location, the horse's workload, as well as stabling and pasture management. Understanding these cluster characteristics means that future research can be targeted towards owner groups that require improvement in the way their horses are fed and managed.

Keywords: equine nutrition; pasture management; multiple correspondence analysis

GLOSSARY

Aid: Any of the signals used to elicit responses in horses. Rein, leg, whip and spur aids are initially learned through negative reinforcement and then transformed to light aids (light rein, light leg, voice, seat) via classical conditioning. The difference between cues and aids is that aids may vary in intensity, whereas cues are typically of the same intensity. Traditionally, the aids are divided into two groups: natural aids and artificial aids. This distinction is misleading as it refers to what is 'naturally' available to the rider, but it neither identifies nor correlates with the two learning modalities through which the horse acquires its responses to the aids.

Approach conditioning: An operant conditioning technique that reduces flight behaviours using the natural tendency of horses to investigate and approach unknown objects, in combination with systematic desensitisation. The horse is encouraged to approach the object that it is fearful of, which then retreats as the horse approaches. The horse may then be signalled to stop before it reaches its fear threshold, so that the object retreats even further. The horse is then signalled to catch up. As soon as the horse slows its approach it is deliberately stopped and this is repeated until the horse comes as close as possible to the object. The horse usually becomes increasingly motivated to investigate the object.

Blocking: A form of interference with classical conditioning; once an animal has learned that a given stimulus predicts a certain event the animal may fail to learn new associations, i.e. a second stimulus may not become a conditional stimulus because learning has been blocked by the presence of the first conditional stimulus.

Classical conditioning: The process whereby an animal learns to correlate external events, e.g. the animal is presented to a neutral stimulus (e.g. a sound) which is followed by a biologically important stimulus (e.g. a noxious stimulus such as a shock, or a positive stimulus such as food). In equitation, classical conditioning is the process where learned responses are elicited from more subtle versions of the same signal or to entirely new signals, e.g. when a horse learns to react to voice commands, visual cues, or rider seat cues.

Cognition: The mechanisms by which animals acquire, process, store and act on information from the environment. The study of cognition covers many topics such as perception, learning, memory and communication.

Conflict behaviour: Stress-induced behavioural changes that arise from conflicting motivations, especially when avoidance reactions are prevented. Conflict behaviour may be agonistic behaviours, redirected aggression or displacement activities. If the stressor is recurrent, conflict behaviour may manifest as repetition and ritualisation of original conflict behaviours. Stereotypies and self-mutilation may develop from severe, chronic or frequent stressors. In equitation, conflict behaviours may be caused by application of simultaneous opposing signals (such as go and stop/slow) such that the horse is unable to offer any learned responses sufficiently and is forced to endure discomfort from relentless rein and leg pressures. Similarly, conflict behaviour may result from incorrect negative reinforcement, such as the reinforcement of inconsistent responses or lack of removal of pressure.

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 controversy relating to the pressure that the horse should endure. In classical equitation, contact with the rein and rider's leg involves a light pressure (approximately 200g) to the horse's lips/tongue and body, respectively. A heavy contact may cause progressive habituation leading to diminished reactions to rein and leg signals as a result of incorrect negative reinforcement and/or simultaneous application of the aids.

Counter-conditioning: A type of training based on the principles of classical conditioning that attempts to replace fear responses to a stimulus with more desirable responses. The term means training an animal to show a behaviour which is opposite or different to the one the trainer wishes to eliminate. The technique is widely used

in combination with systematic desensitisation. By ensuring that the preferred behaviour is more rewarding, the animal learns to perform the new behaviour when exposed to the problematic stimulus.

Cue: An event that elicits a learned response.

Ethogram: A list of the type of behaviours performed by a species in a particular environment. The list includes precise descriptions of each behaviour. It is fundamental to any study of animal behaviour to define which behaviour types are being observed and recorded.

Ethology: The scientific and objective study of animal behaviour, usually with a focus on behaviour under natural conditions, and viewing behaviour as an evolutionarily adaptive trait.

Extinction: The disappearance of a previously learned behaviour when the behaviour is no longer reinforced. Extinction can occur in all types of behavioural conditioning, but it is most often associated with operant conditioning. When implemented consistently over time, extinction results in the eventual decrease of the undesired behaviour, but in the short-term the animal may exhibit an extinction burst.

Extinction burst: A sudden and temporary increase in the frequency or magnitude of a behaviour, followed by the eventual decline and extinction of the behaviour targeted for elimination. Extinction bursts are more likely to occur when the extinction procedure is in the early stages.

Flooding (response prevention): A behaviour modification technique where the animal is exposed to an overwhelming amount of the fear-eliciting stimulus for a prolonged period of time while avoidance responses are prevented, until the animal's apparent resistance ceases. The method is generally not recommended because there are severe risks associated with the method, e.g. injuries due to exaggerated fear reactions.

Foundation training: The basic training of a young horse to respond to aids and cues that control its gait, tempo, direction and posture for whatever purpose may be required. Foundation training may also include habituation to saddle and rider.

Freeze: The sudden alert motionless stance associated with a highly attentive reaction to an external stimulus.

Habituation: The waning of a response to a repeated stimulus that is not caused by fatigue or sensory adaptation. Habituation techniques include systematic desensitisation, counter- conditioning, over-shadowing, stimulus blending and approach conditioning.

Hard/tough-mouthed: Describes horses that have habituated to rein pressure. This is generally a result of incorrect negative reinforcement and can result in learned helplessness and conflict behaviours.

HPA axis (Hypothalamic–Pituitary–Adrenal axis): An organ system comprising the hypothalamus, the pituitary gland and the adrenal gland. The activation of the HPA axis is heightened when an animal is challenged with a stressor, and HPA axis products, such as cortisol, can serve as a physiological indicator of stress in animals.

Hyper-reactive behaviour: Behaviours characteristic of an activated HPA axis and associated with various levels of arousal. Such behaviours typically involve the horse having a hollow posture and leg movements with increased activity and tempo, yet shorter strides. Hyper-reactive behaviours are quickly learned and resistant to extinction because of their adaptiveness in the equid ethogram. Behavioural evidence of hyper-reactivity ranges from postural tonus to responses such as shying, bolting, bucking and rearing.

Learned helplessness: A state in which an animal has learned not to respond to pressure or pain. It arises from prolonged exposure to aversive situations or insufficient environments without the possibility of avoidance or control. It may occur from inappropriate application of negative reinforcement or positive punishment, which

results in the horse being unable to obtain release from or avoid the aversive stimuli. If this continues over a period of time the horse will no longer make responses that were once appropriate, even if they would be appropriate under the present conditions.

Negative punishment (subtraction punishment): The removal of something pleasant (such as food) to punish an undesired response and thus decrease the probability of that response.

Negative reinforcement (subtraction reinforcement): The removal of something aversive (such as pressure) to reward a desired response and thus increase the probability of that response.

Operant conditioning (instrumental conditioning): The process whereby an animal learns from the consequences of its responses, i.e. through positive or negative reinforcement (which will increase the likelihood of a behaviour), or through positive or negative punishment (which will decrease the likelihood of a behaviour).

Overshadowing: The effect of two signals of different intensity being applied simultaneously, such that only the most intense/relevant will result in a learned response. It can explain why animals sometimes fail to associate the intended cue with the desired behaviour in favour of a different stimulus that was happening unintentionally at the same time and which was more relevant to the animal. The term overshadowing also denotes a desensitisation technique where habituation to a stimulus is facilitated by the simultaneous presentation of two stimuli that elicit a withdrawal response (such as lead rein cues/pressure and clippers or a needle).

Positive punishment (addition punishment): The addition of something unpleasant to punish an undesired response and thus decrease the probability of that response. Incorrect use of positive punishment can lower an animal's motivation to trial new responses, desensitise the animal to the punishing stimulus and create fearful associations.

Positive reinforcement (addition reinforcement): The addition of something pleasant (such as food or a pleasant scratch) to reward a desired response and thus increase the probability of that response.

Punishment: The process in which a punisher follows a particular behaviour so that the frequency (or probability) of that behaviour decreases. See also Positive punishment and Negative punishment.

Reinforcement: The process in which a reinforcer follows a particular behaviour so that the frequency (or probability) of that behaviour increases. See also Positive reinforcement and Negative reinforcement.

Reinforcement schedule: The frequency of the reinforcers used in training. The schedule may be continuous, intermittent or declining.

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

- *Primary reinforcer*: A stimulus that is considered naturally rewarding (e.g. food).
- *Secondary reinforcer*: A stimulus that has become associated with a rewarding stimulus and thus has been conditioned to be rewarding for the horse (e.g. the sound of a clicker which has been associated with a food reward).

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.

Stereotypy: A repeated, relatively invariant sequence of movements that has no function obvious to the

observer. Stereotypies are abnormal behaviours and are generally considered as a sign of impaired welfare. Stereotypic behaviour arises from frequent or chronic stress and may help the animal to cope with adverse conditions. The behaviours may persist even if the triggering factors are eliminated. A number of stereotypic behaviours, such as box-wandering, pacing and crib-biting are seen in horses and are erroneously referred to as stable vices.

Stimulus blending: A desensitisation technique that uses a closely resembling stimulus, to which the horse is already habituated, to systematically desensitise the horse to the fear-inducing stimulus. The fear-inducing stimulus is applied simultaneously with the known, non-fear-inducing stimulus, and then systematically increased in intensity. The aural and tactile characteristics of the two stimuli are gradually mixed, making identification of the new one difficult and different. The old benign stimulus can then be diminished and finally terminated after which the horse will show habituation also to the new stimulus.

Stimulus control: The process by which a response becomes consistently elicited by a light aid or cue.

Stress: Stress is a state which is characterised by the behavioural and physiological responses elicited when an individual perceives a threat to its homeostasis ('internal balance'). The threat is termed a stressor.

Stressor: Anything that disrupts homeostasis, e.g. physical and psychological threats incl. lack of fulfilment of natural behavioural needs. Stressors appear to be stressful to the extent they contain elements of loss of control, loss of predictability, and absence of outlets for frustration.

Stress response: The body's adaptations evolved to re-establish homeostasis. Stress responses are elicited when an animal anticipates or faces a stressor and involves a range of endocrine and neural systems. The responses are somewhat non-specific to the type of stressors that trigger them. Stress responses are in nature adaptive; however, when these responses are provoked for a long duration or repeatedly, they can cause negative effects such as increased susceptibility for diseases, gastric ulceration, abnormal behaviour, reproduction problems and reduced performance.

Systematic desensitisation: Systematic desensitisation is a commonly used behaviour modification technique for the alleviation of behaviour problems caused by inappropriate arousal. In a controlled situation, the animal is exposed to low levels of the arousing stimulus according to an increasing gradient, until habituation occurs. An increase in the level of the stimulus is not made until the animal reliably fails to react to the previous level. In this way, the technique aims to raise the threshold for a response. The decrease in arousal can be reinforced by either negative or positive reinforcement.

A QUICK GUIDE TO STATISTICS FOR NON-SCIENTISTS

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The 'scientific process' comprises the six steps listed below. The application of statistics is a tool which enables reliable conclusions to be reached and the research objective to be answered. Statistical analysis is not that difficult and simply involves following a series of simple steps and rules. An example is used to demonstrate the steps required for a simple scenario where the researcher needs to apply the two sample t test in order to statistically assess the difference between two sets of data. (All text relating to the example given is highlighted with grey shading.)

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 statistical tests are conducted.

The Independent Variable is 'Training method' and has two levels:

3. Formulating hypotheses

All research projects rely on the examination of hypotheses. Each statistical analysis relies on the simultaneous examination of a pair of hypotheses which are opposites of each other and always follow the 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 (n, as a rough guide is that anything less than 30 is considered to be a 'small' sample) and to match everything about the individuals contributing to each sample as evenly as possible.

All of the horse and rider combinations in this study will be competing at a similar level, and performing the same dressage test, under the same conditions.

Sample data (Dressage scores, %)	
Method A	60 60 60 50 64 56 55 56 48 44 53 53 59 54 57 52 52 59 56 61 55 50 58 56 52 62 53 67 58 51
Method B	60 73 69 67 72 67 65 64 64 72 64 72 61 68 70 74 61 63 66 68 66 72 70 68 55 87 60 66 68 69 183

Two types of data analysis are applied: first, exploratory, descriptive analysis which provides averages and an indication of the spread of the data; and second, confirmatory statistical analysis which yields 'test statistics' and probabilities and ultimately allows a statistical conclusion to be reached. The latter will then allow a conclusion to be reached in relation to the objective of the study.

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% typically presented as 55.7±4.93%. 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 two sample t test). This will produce a test statistic and a probability value, P.

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 then 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 in order for the results to be considered to be reliable.

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

- If the P value obtained is less than 0.05, the Ha is accepted and the Ho is not accepted. The conclusion is then 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 not accepted. The conclusion is then reached that there is not a significant difference between the two samples. (Here scientists state that there is a non-significant difference.)

ISES 2022

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10th to 12th of August 2022 (9thpre-conference workshop)

We look forward to welcoming you to Hartpury University for the 2022 International Society for Equitation Science Conference. Building on this year's conference themes, we will be exploring how science can be used to enhance horse and rider performance through ethical and evidence-informed equitation, management and training practices; we will explore the horse-human relationship and how science can enable us to understand and meet the needs of our equine partners, and how this can influence equine quality of life and human wellbeing. Alongside this we will challenge leading educators, researchers, practitioners, riders and coaches to give us their perspective on the emerging challenges across equitation science and their solutions to ensure the future sustainability of equestrian sports. We are looking forward to welcoming you to our beautiful campus, but for those of you unable to join us in person, we will be live-streaming the event.

Watch world-class eventing while you are with us! Hartpury' International Horse Trials will be running alongside the conference, and delegates are welcome to stay on and watch all the action of the cross -country and showjumping on Saturday and Sunday 13-14th August.

See you all in 2022!

Hartpury is one of the world's leading equine universities, as well as specialising in sport, animal and agriculture. Situated in 360-hectares in the heart of Gloucestershire, just 15 minutes from Gloucester city centre, we are well placed as a base to explore London, the Cotswolds, Oxford and wider.