11th Alltech-Hartpury Student Conference

Conference Proceedings

1st June 2022

HARTPURY UNIVERSITY

Hello & welcome…….

Alltech® is one of the top ten global animal health companies dedicated to providing natural solutions to today's animal challenges. It is a leader in innovation and education and is proud to be associated with Hartpury University for the jointly run, annual student conference. The Alltech-Hartpury Conference is aimed at students and scientists who are interested in the application of emerging research. Traditionally, conferences can be a daunting place for students to present research work. As such, this conference gives both undergraduate and postgraduate students the chance to experience a scientific conference, from the process of abstract submission and review, to delivering a theatre presentation or producing a conference poster. In collaboration with Hartpury University, Alltech® offers the opportunity to, not only promote equine research, but to bring the next generation of researchers in to contact with today's experts.

H.Wax

Dr Helen Warren; European Technical Manager, Alltech

On behalf of Hartpury University and the Alltech-Hartpury Conference Committee, it is our pleasure to welcome you to the 11th Alltech-Hartpury Conference. It is great to be finally welcoming delegates back on to our beautiful campus, after almost three years. Staff within Hartpury University's Department of Equine Science are passionate about our subject and one of our wider aims is to maximise opportunities for dissemination of research to the wider equine forum. Our collaboration with Alltech® has provided a unique opportunity for like-minded academics, industry professionals and students to debate emerging ideas, which could have a positive impact on performance, health and welfare of the horse, and the development of the equine industry. We are pleased with the breadth of topics and the standard of the presentation topics in today's programme and are looking forwards to what is predicted to be an enjoyable and inspiring conference day; we hope you are too.

K Leśniak

Dr Kirsty Leśniak; Conference Organiser, Senior Lecturer in Equine Science, Hartpury University

Acknowledgements

The Alltech-Hartpury Conference Committee gratefully acknowledges the support of all collaborative partners who have made this conference possible. We are very much indebted to the peer review team of Dr Helen Warren, Dr Georgina Crossman, Dr Jane Williams, Lorna Cameron, Dr Lucy Dumbell, Dr Simon Daniels, Dr Sophie Hiscocks, Natalie Stones, Emma Davies, Dr Debbie Nash and Dr Celeste Wilkins who have given their time freely to offer support and guidance to those presenting today.

Thanks also to the staff members of Hartpury University who have helped setup in preparation for the conference. Gratitude is also extended to Dr Jane Williams, Dr Tamzin Furtado and Yogi Sharp for delivering the keynote presentations.

Prizes

Prizes will be awarded for the best theatre and poster presentations.

Prizes have kindly been sponsored by Alltech®.

Alltech-Hartpury Conference Committee members 2022

Dr Kirsty Lesniak (Lead organiser)

Dr Helen Warren (Alltech® sponsor lead)

Emma Davies

Lorna Cameron

Victoria Walker

Laura-Jane Roberts

Aisling Carrol

Rebecca Coleman

Jenny Paddison

Sophie Armstrong

Scientific Programme Wednesday 1st June

Morning Session:

8.30am Onsite registration and online log-in opens

9.10am Dr Helen Warren and Dr Kirsty Leśniak: Welcome to the conference

9.15am: Dr Jane Williams; Hartpury University - Generating positive partnerships: preparation, practice and performance analysis

10.00am Undergraduate Student Oral Presentations

10.00am: Josephine Southey: Ease the tension! University Centre Sparsholt

10.15am: Klara Kratz: The effects of induced stirrups asymmetry on rider biomechanics; Writtle University College

10.30am: Laura Bridle: Current perception of equine obesity between various equine stakeholders; University Centre Sparsholt

10.45am Poster session with refreshments at Hartpury House

11.15am Undergraduate Student Oral Presentations

11.15am: Kirsty Tamilia: The effect of turmeric supplementation on equine in vitro hindgut fermentation parameters and metabolome; Aberystwyth University

11.30am: Lauren Steel: An investigation into the psychological response of injury in point-to-point jockeys; Hartpury University

11.45am: Alice Clark: The effect of the use of ground poles and raised poles on hindlimb range of motion and hindlimb hoof height; University Centre Myerscough

12.00pm Lunch break

Afternoon Session:

1.00pm Dr Tamzin Furtado: University of Liverpool - From overbreeding to obesity: what is the one key to improving every equine welfare issue?

1.45pm Undergraduate Student Oral Presentations

1.45pm: Menstruation related issues in female horse riders; University Centre Sparsholt

2.00pm: Lizzie Millington: The immediate effects of an equine physiotherapy intervention on spinal kinematics; Hartpury University

2.15pm Poster session and expert panel discussion, with refreshments at Hartpury House

3.00pm Postgraduate Student Oral Presentations

3.00pm: Pippa Hopkins: Impact of toe clips and quarter clip shoes on the lamellar and skeletal structure in the foot of a horse; Hartpury University

3.15pm: Christy Maddock: Hock instability in the horse: relationship with pelvic symmetry and hindlimb muscle development. Hartpury University

3.30pm Yogi Sharp: The Equine Documentalist: The fluid relationship between hoof morphology and posture.

4.15pm Presentation of prizes

4.40pm Conference closes

Associate Professor, Dr Jane Williams

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 qualified as a Veterinary Nurse then 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, and has published over 100 research articles as well as regularly presenting at international equine conferences. She is also Honorary President for 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. Jane is a member of the editorial board of Comparative Exercise Physiology and Animals journals.

Dr Tamzin Furtado

University of Liverpool

Tamzin is a social scientist with a background in global health, and has a specific interest in the interconnections between human and animal health and wellbeing. She completed a PhD at the University of Liverpool studying how we can improve the management of obesity in horses, particularly focusing on horse-human relationships and human behaviour change. She now works on projects covering a wide range of aspects of understanding human behaviour in order to improve companion animal welfare, and in using social sciences to find out more about how we can help people to change. She competes in endurance up to advanced level.

Yogi Sharp DipWCF

The Equine Documentalist

Yogi has a passion for research and for playing a role in encouraging the horse care industry, from the hoof upwards, towards more evidence-based practices. His passion for disseminating practicably applicable research led to him becoming the founder of the online platform, "The Equine Documentalist".

Yogi runs a successful farriery business in the U.K. During the summer he looks after world leading polo ponies, including those who won the Queens Cup last year and finished in silver place for the Gold Cup.

He is an experienced clinician and has spoken at conferences and seminars to farriers and practitioners around the world, often with focus on the hoof-horse connection.

Yogi completed his BSc (Hons) in farriery with a first class and is now progressing his research further by undertaking a PhD. His talk shares the findings of his BSc (Hons) research, which was a preliminary study looking to demystify the documented connections between negative plantar angles and associated higher pathologies.

Ease the tension!

*Southey, J. *, Knight, C. and Stones, N.*

University Centre Sparsholt, Hampshire, U.K.

Keywords: Rein tension, recreational riders, riding school, horse.

Introduction: Reins connect from the horses' bit to the riders' hands and when the rider pulls the reins this provides a form of negative reinforcement (ISES, 2018) in negotiating horse speed, direction, and head carriage. Rein tension is utilised in addition with other cues to achieve a desired response and rein tension can be affected by the gait of the horse, position of rider and level of horse (Eisersio, et al. 2015). Rein tension is seen to be greater in the canter phase and increases in rein tension can also be present due to rider asymmetries, and the incorrect application of cues leading to adverse behavioural responses. The aim of this study was to see if there was a significant difference in rein tension between two riding school horses.

H'- There will be a significant difference in rein tension between the different riding school horses.

H^0- There will be no significant difference in rein tension between the different riding school horses.

Materials & methods: A convenience sample of two horses and 14 regular attendee riders of the riding school took part in the study, both riders rode horse one and horse two consecutively. Horse one was a 16.1hh, Thoroughbred ex-racehorse gelding and horse two was a 14.3hh, cob mare. A convenience sample of recreational riders were observed during their ridden session where they were required to ride different horses (n=2). On arrival human participants were required to fill out a consent form and a demographic questionnaire. Ipos rein tension meters (Ipos Technology, Eindhoven, The Netherlands) were attached onto the bit and connected to the rein; the system was then connected to a mobile device in order to record the rein tension output which was given in kg. All riders began on horse one and riders were required to ride three figures of eight in walk, five in trot and one canter large around the arena on the right rein followed by one canter left. This process was then replicated on horse two with the Ipos rein tension meters. To identify differences between horse 1 and horse 2 these variables were extracted and then compared using a General Linear Model in Minitab 19. From the results presented, it was most appropriate to further run a post-hoc comparisons test to be able to test the relationships between the different conditions between trot and canter, walk and canter, walk and trot. The method utilised was the Tukey pairwise comparisons, testing individual means from the different conditions presented.

Results: The results suggested, there was a significant difference between the two horses ($p<0.0001$), riders ($p<0.0001$), and rein tension ($p< 0.001$) with there being a much higher left rein tension on both horses compared to the right rein. There was also a significant difference between the different conditions (walk, trot, and canter) ($P<0.0001$), it was further identified that canter had

the highest amount of rein tension, with comparisons of trot to canter being highly significant ($p<0.0001$) and similarly with walk and canter ($p<0.0001$), and with walk and trot ($p=0.02$).

Discussions & Conclusions: The results of this study confirmed there is a significant difference in rein tension between the different riding school horses. This could be because of horse and rider asymmetries, rider ability, rider anatomy and mental state, and the gait of the horse similar to previous studies contributes to the amount of rein tension present. Consideration of correct horse and rider matching is essential to promote school horse health and welfare.

Acknowledgements: I would like to thank Sarah Mitchell-Sheppard for the use of her riding establishment SMS Equestrian enabling me to carry out this study.

References:

Eisersio, M. Rhodin, M. Roepstorff, L. & Egenvall, A. (2015). Rein tension in 8 professional riders during regular training sessions. *Journal of Veterinary Behaviour.* ***10***(5): pp419-426. https://reader.elsevier.com/reader/sd/pii/S1558787815000787?token=0EEC3BBCF250157A000E4C0F16B85CDEA1184ADCC2827AF2F8683CC8961B3CDE09ACD46035FAAFA7E748C61E68E8641C&originRegion=eu-west-1&originCreation=20220205093846

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The effects of induced stirrups asymmetry on rider biomechanics

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Key words: Equine, Horse, Equitation

Introduction: Within equestrian sport, two athletes work together to achieve their goals. The rider's symmetry and balance is therefore crucial to allow for good communication and avoidance of injury to the rider and horse (De Cocq *et al.*, 2004). Riders choose their stirrup length dependent on their own leg length, discipline, and overall personal preference (Andrews-Rudd *et al.*, 2018). However, there is little research investigating the effects of stirrups asymmetry on the rider. The purpose of this study was to determine whether there were statistically significant differences in the biomechanics of the rider when riding with three different stirrup asymmetries. E hypothesised that a mild stirrup asymmetry would lead to overall rider asymmetry.

Material & methods: Six, righthanded, female riders rode a horse simulator with a 17-inch saddle (Fairfax Saddles Ltd, Aldridge, UK) at sitting and rising medium trot, canter and two-point canter. Each pace was ridden with level stirrups, the left stirrup two holes longer and the right stirrup two holes longer in a randomised order. Reflective markers were placed on the riders' medial border of the scapula spines, posterior superior iliac spines, and calcaneus. Each gait-stirrup asymmetry combination was recorded at 240Hz. Videos were analysed on Quintic Biomechanics v.31 (Quintic Consultancy Ltd, Birmingham, UK). The outcomes were hip, shoulder and ankle angles at each gait-stirrup combination. A zero-degree angle between the left and right marker was considered as symmetric. In rising trot there were two points measured: (1) rising trot maximum (RTMAX) in the full standing position and rising trot minimum (RTMIN) during seated position. These points were determined by the highest and lowest point of the scapula markers. Statistical tests were run on SPSS v.27 (IBM, Armonk, USA). Hip angle at canter was analysed with Friedman's test and the other variables were analysed by repeated measures ANOVA. A post hoc analysis was then conducted with Bonferroni correction (95% confidence interval). The results report SPSS Bonferroni adjusted p-values.

Results: There were no statistically significant results found for shoulder or hip angles at any stirrup-gait combination ($p>0.05$). Statistically significantly different results were found for heel angles at RTMIN ($p=0.013$). Heel angle at RTMIN statistically significantly increased with the left stirrup longer when compared with the right stirrup longer (-2.387 (95% CI, -4.256 to -0.517)°, $p=0.019$. (Fig. 1). Likewise, for canter, heel angles were statistically significantly different ($p=0.048$), being increased with the left stirrup longer when compared with the right stirrup longer (-2.387 (95% CI, -4.256 to -0.517)°, $p=0.01$ (Fig. 2). Although the other angles were non-significant, when stirrups were altered there was an increase in the asymmetry of the rider's biomechanics.

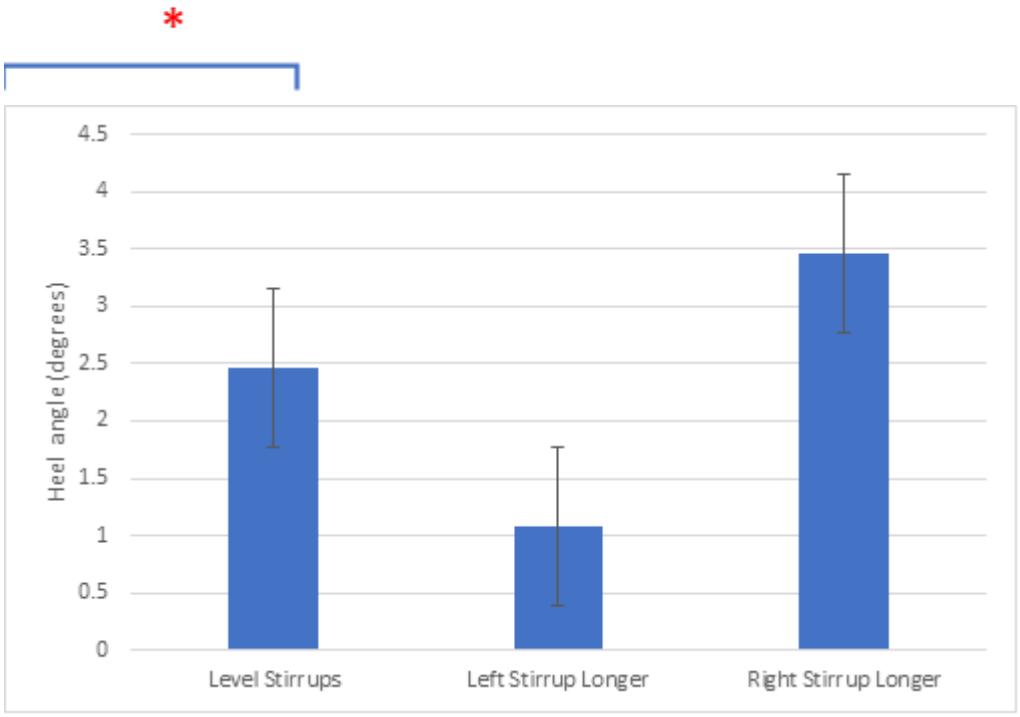

Figure 1: Heel angles (°) of different stirrup asymmetries at rising trot during seated position (RTMIN) showing a decrease in the heel angle from level stirrups to the left stirrup longer and an increase from the left stirrup longer to the right stirrup longer. Error bars indicate standard error. * Indicates significant difference ($p<0.05$) by repeated measures ANOVA.

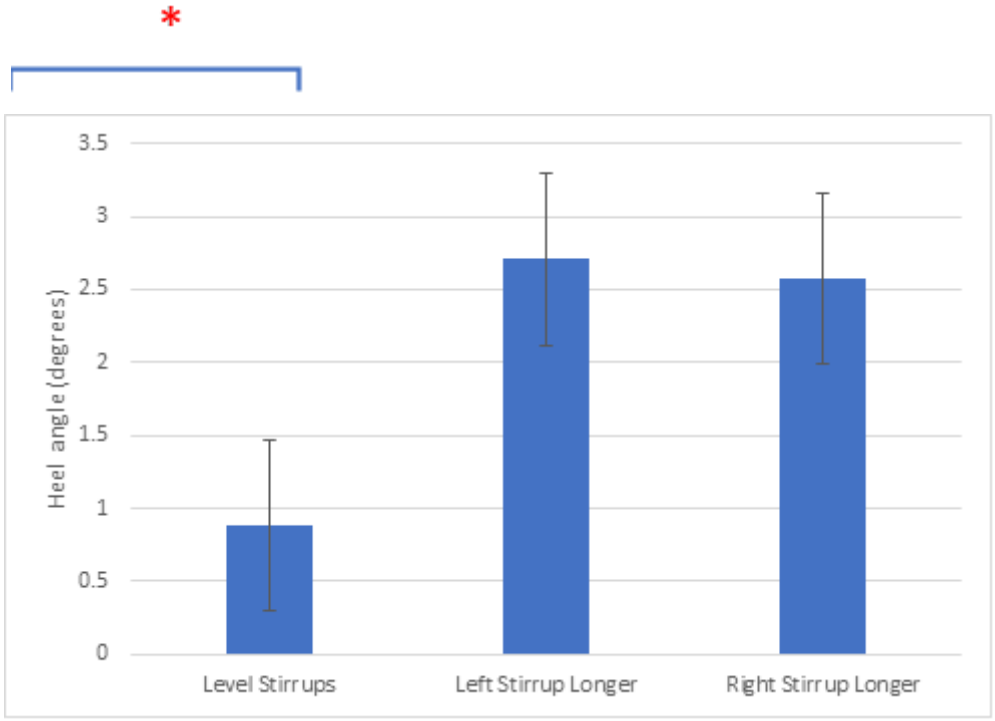

Figure 2: Heel angles (°) of different stirrup asymmetries at canter showing a statistically significant increase in the heel angle from level stirrups to the left stirrup longer and a decrease from the left

stirrup longer to the right stirrup longer. Error bars indicate standard error. * Indicates significant difference ($p<0.05$) by repeated measures ANOVA.

Discussion & conclusions: The aim of this study was to determine whether riding with symmetrical or asymmetrical stirrups would elicit rider asymmetries. A clear chain reaction became evident as heel angles had significant asymmetry, and, although non-significant, there were trends for shoulder and hip asymmetry. The heel angles asymmetries were detected at rising trot and canter. Heel angles were unexpectedly low (usually <4°) when considering the degree of induced stirrup asymmetry and possibly each rider adjusted their heel height to compensate for the induced asymmetry. Shoulder and hip asymmetries were already seen with level stirrups and have increased after stirrups asymmetries were induced. The riders in this study were all right-handed and it is interesting to see that when the right stirrup was longer, the majority of riders became more asymmetric as their dominant leg had less control (Stapley et al., 2020). In conclusion, induced stirrup asymmetry causes the rider to alter their biomechanics in an attempt to stay seated straight on the horse and keep the center of mass close to the horse's midline.

References:

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De Cocq, P., Van Weeren, P.R. & Back, W. (2004) Effects of girth, saddle and weight on movements of the horse. *Equine Veterinary Journal*. **36**(8): pp758–763.

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Current Perception of Equine Obesity Between Various Equine Stakeholders.

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University Centre Sparsholt, Hampshire, U.K.

Key Words: Obesity, Equine, Perception, Stakeholder.

Introduction: Equine obesity is the accumulation of excessive adipose tissue developing due to abnormal biological regulation of energy. It poses considerable welfare concerns and has associative links to Laminitis and Equine Metabolic Syndrome (EMS) (Reynolds et al., 2019). Owner perception and management play key roles in recognising and preventing obesity, but these can differ with individual owners due to a myriad of factors (Furtado et al., 2018). There are various weight management techniques that can be used to manage bodyweight including body condition Scoring (BCS) and grazing muzzles (Furtado et al., 2020). Educational campaigns remain a positive advocate for the future providing education is tailored to stakeholder groups to reduce the prevalence and impact obesity presents. There is limited empirical research surrounding specific differences relating to obesity perception across various stakeholder groups. This study aimed to investigate prevalent differences within stakeholder perception, to support education being tailored more effectively to collectively reduce obesity and its welfare concerns.

Materials & methods: An online survey consisting of 27 questions with varying question styles such as demographic questions, opened ended, Likert scales, and scenarios was conducted over an eight-week period (n=1,163) via GoogleForms™ to allow stakeholder perception of obesity to be established. When recognising associative conditions (see table one), weight management feasibility including, no turnout, weigh tape, dietary restrictions, weigh bridge, clinical tests, industry professional advice and BCS, and educational campaigns (see table two). Data acquired were analysed using One-Way ANOVA, Kruskal-Wallis, and Mann-Whitney tests where appropriate using the platform Minitab 19 and the significance value P=0.05.

Results: 51% (n=1,163) categorised themselves as leisure stakeholders, 21% as amateur, 15% as responsible for horse care, 4% rode competitively, 1% being non horse owners and 5% as professionals. 96% respondents were female, 2% male and 1% did not specify. A diverse age range of 18 to 65+ were acquired whereby the majority were between 55-64 years old (23%). 94% of respondents recognised obesity as a welfare concern yet only 64% would be embarrassed when owning or caring for an obese horse. 79% stated the most common cause was incorrect dietary management and 79% used BCS to monitor weight. Significant differences were found between all associative conditions (see table one). No significant differences were found between all weight management techniques. Both significant and non-significant differences were found when recognising educational campaigns associated with obesity (see table two). A significant difference

found between leisure and professional categories when recognising the Blue Cross – Fat Horse Slim campaign (see table three).

Table 1: Results of associative condition recognition across various equine stakeholders (* = significant value).

Associative condition	**P-Value**
Laminitis	0.002*
Arthritis	<0.01*
Heart disease	0.04*
Lung problems	<0.01*
Equine Metabolic syndrome	0.02*
Pituitary pars intermedia dysfunction	0.003*
Reproductive issues	<0.01*

Table 2: Results of educational campaign recognition across various equine stakeholders (* = significant value).

Educational campaign	**P-Value**
Blue cross (BC) – Fat horse slim	<0.01*
World Horse Welfare (WHW) - Right weight	0.15
Horse Trust (HT) -When the grass is greener	0.05*
British Equine Veterinary Association (BEVA) - Fighting back against obesity	<0.01*
Horses & Ponies Protection Association (HAPPA) - Fat on fresh air	0.05 *

Table 3: Results as to whether significant differences lie between leisure and professional stakeholder groups (* = significant value).

Educational campaign	**P - Value**
Blue cross (BC) – Fat horse slim	<0.01*
Horse Trust (HT) -When the grass is greener	0.49
British Equine Veterinary Association (BEVA) - Fighting back against obesity	0.29

Discussion & conclusions: There are evident differences between stakeholder perception, specifically between leisure and professional groups. Weight management and weight monitoring techniques are recognised, yet application of weight management to reduce obesity is still desired. Geographical location, climate, stakeholder industry experience, knowledge and age can influence perception (Barry-Macaulay et al., 2013). These factors should be considered when tailoring educational resources for stakeholders to utilise, to encourage industry change by reducing obesity prevalence and the welfare concerns it presents. These factors were not taken into consideration within this particular study. Therefore, further empirical research is required to establish the full impacts that each factor presents when influencing perception before educational resources are tailored and implemented within industry.

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The effect of turmeric supplementation on equine *in vitro* hindgut fermentation parameters and metabolome.

Tamilia, K.J. and Wonfor, R.E.*

Aberystwyth University, Institute of Biological, Environmental and Rural Sciences.

Key words: Turmeric, Metabolome, Fermentation, Horse.

Introduction: Turmeric is an herbaceous plant, traditionally used in Asian medical folklore. Evidence of intestinal and caecal microbial shifts have been recorded in rats (Feng *et al.,* 2017) and ducks (Zhai *et al.,* 2020) respectively, when supplemented with curcumin; turmeric's active component. Turmeric supplementation is becoming increasingly popular in the equine industry, however there is no scientific evidence whether the equine hindgut microbiome is altered when supplementing. Stability of the hindgut microbiome is essential in maintaining horse health; hence the aim was to assess the effect of turmeric on hindgut fermentation parameters and the metabolome in an *in vitro* equine hindgut gas production model.

Methods: Two turmeric treatments were used; pre-digested at 0.045g/bottle (PRE, no pre-caecal digestion) and post-digested at 0.027g/bottle (POST, using pre-caecal digestion consisting of pepsin hydrochloric acid treatment followed by pancreatin treatment), compared to control (CTR, no turmeric). Per treatment, 10 replicates were used with 5 containing substrate and 5 blank. Substrate was pre-caecally digested, consisting of 70% hay and 30% barley. Inoculums consisted of 5 faecal samples. Fermentation parameters (potential and speed) were assessed over 72h using the Ørskov and McDonald (1979) model. The pH was determined at 24h and 72h and metabolome assessed at 24h via FTIR. One-way ANOVA was performed on fermentation parameters and pH using Statistical Package for the Social Sciences (SPSS), with Tukey HSD as post-hoc test. Gas production was analysed using repeated measures ANOVA and FTIR data analysed via principal component analysis (PCA) using PyChem.

Results: Gas production increased over time (P = 0.08) but was not affected by turmeric treatment (P = 0.361). When assessing fermentation parameters, fermentation speed was greater in PRE turmeric treated inoculums (P = 0.006), yet there was no difference in fermentation potential following turmeric treatment (P = 0.180). In addition, pH was not affected by turmeric supplementation at 24h (mean = 6.856; P = 0.595) or 72h (mean = 6.575; P = 0.501). Metabolome analysis via FTIR demonstrated no significance following supplementation, although slight clustering between supplementing turmeric (POST) or not (CTR) was observed from the PCA output (Figure 1).

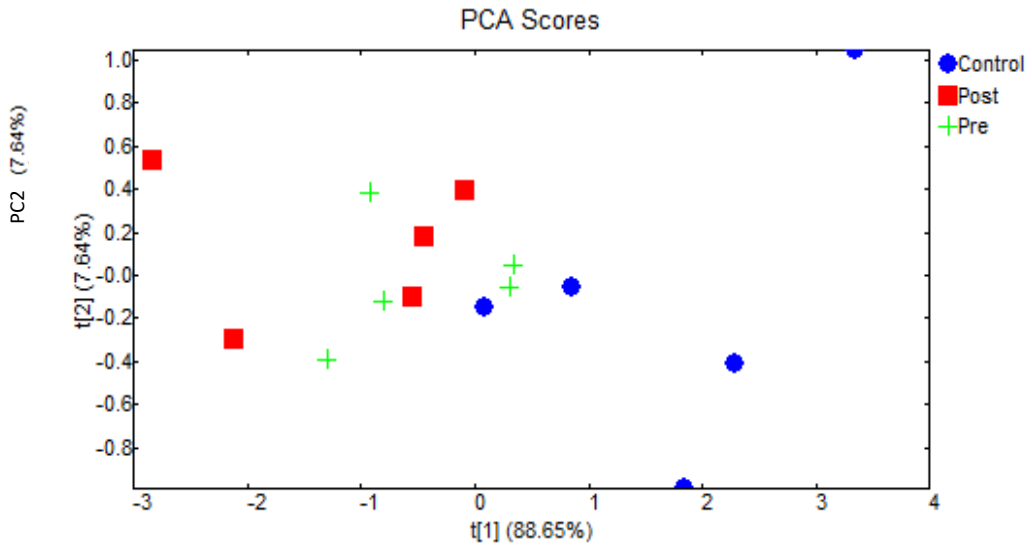

Figure 1: PCA plot showing the variance of faecal samples treated with differing turmeric treatments (CTR, PRE and POST) from FTIR analysis, showing a pair-wise comparison of the largest principle component (PC1) and the next largest principle component (PC2).

Discussion & Conclusions: In an *in vitro* model, turmeric does not affect fermentation potential ('a + b') indicating that turmeric has no impact on microbial fermentation activity, inferring that the metabolome is not impacted. This is further supported by the near neutral pH and insignificant PCA outputs, although this study could be limited by sample repetitions. The increased fermentation speed ('c') of PRE could be indicative of change in hindgut microbiome, which would be supported by the slight clustering in Figure 1, however further research is required to consolidate this finding. It was concluded that turmeric supplementation does not significantly alter equine hindgut microbiome, inferring that supplementation is not at the detriment of the hindgut. Although, *in vivo* studies are required to confirm the safety of turmeric as an equine supplement, as other factors including immune status are not considered.

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An Investigation into the Psychological Response of Injury in Amateur Point-to-Point Jockeys

Steel, L. and Davies, E.

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Key words: psychology, injury, point-to-point, racing

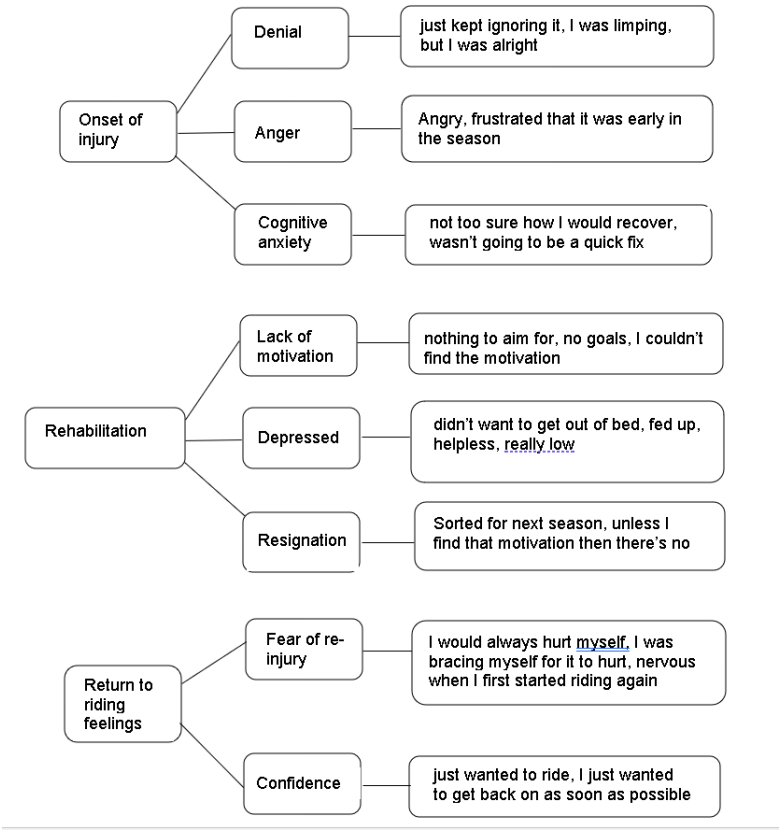
Introduction: Despite the prevalence of injury amongst point-to-point jockeys, comparatively little research exists examining the psychological implications resulting from physical trauma within the sport (Balendra, 2007; Turner, McRory and Halley, 2002). A greater understanding of the psychological repercussions will facilitate the implementation of educationally sound coping strategies which will not only encourage a return to riding post-injury but may also aid the advancement of jockey performance. This study aims to examine the psychological consequence of physical damage amongst the amateur point-to-point jockey community.

Methods: Participants comprised of five point-to-point jockeys all with an injury sustained during the preceding twelve months. Demographic data is shown in the table below.

Participant	Age	Injury	Source of injury	Approximate time off from riding because of injury	Advised time to have off riding	Riding as a career
P1	21	Broken arm	Galloping in training/ horse tripping	6 weeks	12 weeks	No
P2	28	Snapped anterior cruciate ligament	Overuse injury resulting from rugby, riding and ignoring the pain	26 weeks	52 weeks	Yes
P3	25	Broken collar bone and dislocated shoulder	Horse fall over a fence in a chase	8 weeks	8 weeks	Yes
P4	24	Mild concussion and broken pelvis	Horse fell out hacking doing fitness work	9 weeks	Return as an when participant felt ready	Yes
P5	27	Open compound fracture to the tibia and fibula	Riding out/fitness work and horse spooked	12 weeks	12 weeks	Yes

Semi-structured interviews were used to gather information from each of the participants pertaining to their injury. The questions related to three periods throughout their injury timeline: the initial point of injury, the rehabilitation process, the return to competitive riding following recovery. The interviews were then transcribed, and the collated data scrutinised using a thematic

analysis that identified themes and codes (Braun and Clarke, 2006). These themes and codes were then presented in thematic trees to display the results. The thematic trees created are shown below.



Results: Subjects universally cited negative emotional responses because of their injuries, with feelings of denial, anger and cognitive anxiety ubiquitous amongst all participants. Furthermore, lack of motivation, depression and resignation were then identified within the rehabilitation process proceeded by ebbing confidence and fear of re-injury on their return to riding.

Discussion & conclusion: This study aimed to investigate the psychological responses of injury in P2P jockeys and its effect on rehabilitation practises and well-being. Results indicate riders with injury face a multitude of cognitive appraisals which influence emotional and behavioural responses. At the onset of injury denial, anger and cognitive anxiety were found through ignoring pain, frustration of setbacks in the season and anxiety surrounding recovery time. Depressive symptoms resulting from the loneliness and loss they experienced through injury was prevalent in rehabilitation. Lack of motivation was identified whereby the rider lost goals they were working towards, impacting on their adherence to rehabilitation suggesting a prolonged recovery. Resignation was notified where the riders accepted the injury was inevitable, encouraging them to accept recovery was imperative for return to riding. Returning to riding provoked confidence and fear of re-injury. Confidence riders felt impacted the time taken to return to riding, positively influencing their attitude to getting back on. Fear of re-injury effected the riders' physical capabilities changing the way they rode, influencing a difference in performance. To reduce negative

appraisals education of psychological interventions should be implemented by organisations like the P2P Authority to bridge the gap between registered and non-registered jockeys. Future research should look to explore the different psychological impacts of specific injuries and address the limitations of this study to generalise the findings.

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The effect of the use of ground poles and raised poles on hindlimb range of motion and hindlimb hoof height

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Key words: pole work, equine, hindlimb, range of motion

Introduction: The idea of improving the horse's way of going is a topic often discussed among equestrian professionals and ordinary equestrians alike. The need to improve the horse's way of going is important to promote a supple, agile and flexible horse, both laterally and longitudinally to promote good health and performance (Loving 2014). The horse's way of going can be affected using pole work. Limited research is available on the effects of pole work despite it being a highly recommended and utilised exercise to improve way of going. Therefore, the objective of the study was to provide further support to the limited research available by determining whether the use of ground poles and raised poles influenced the horses hindlimb joint range of motion and hoof height, which would impact the horse's way of going.

Method: The methodology used within this study was based on the previous studies conducted by Murray *et al* (2020) and Brown *et al (*2014). Unlike the studies previously conducted this investigation focused solely on the hindlimb, as the hindlimb provides the power for the horse's movement (Clayton *et al* 2001). Therefore, influencing the horses hindlimb by affecting parameters such as joint range of motion will provide the greatest impact on improving the horse's way of going. Six college horses were used, differing in height, breed, age and sex. Markers were placed at the relevant anatomical sites of the hindlimb (the stifle, hock fetlock and coronet band of the hoof) and after completing the same warm up procedure, the horses were required to trot through a series of lanes that were set up in the indoor International Arena with a Quintic High Speed 1.3 camera placed perpendicular to the lanes. Lane 1 consisted of no poles, lane 2 consisted of ground poles and lane 3 consisted of raised poles at a height of 28cm. Every horse trotted through each lane twice on each rein. The relevant kinematic data was collected and subsequently uploaded onto a computer and analysed using Quintic software. The data obtained from Quintic was then uploaded to a spread sheet and analysed using Minitab software. The data was tested for normality using an Anderson Darling normality test and the statistical tests conducted were a Mann-Whitney test and Kruskal Wallis test.

Results: The effect of the use of ground poles and raised poles was significant on the horse's maximum hock angle P=0.021) and peak hoof height (P=0.001). As shown in Figure 1 and Figure 2 the values obtained for the horse's maximum hock angle and peak hoof height increased progressively from no poles, ground poles to raised poles.

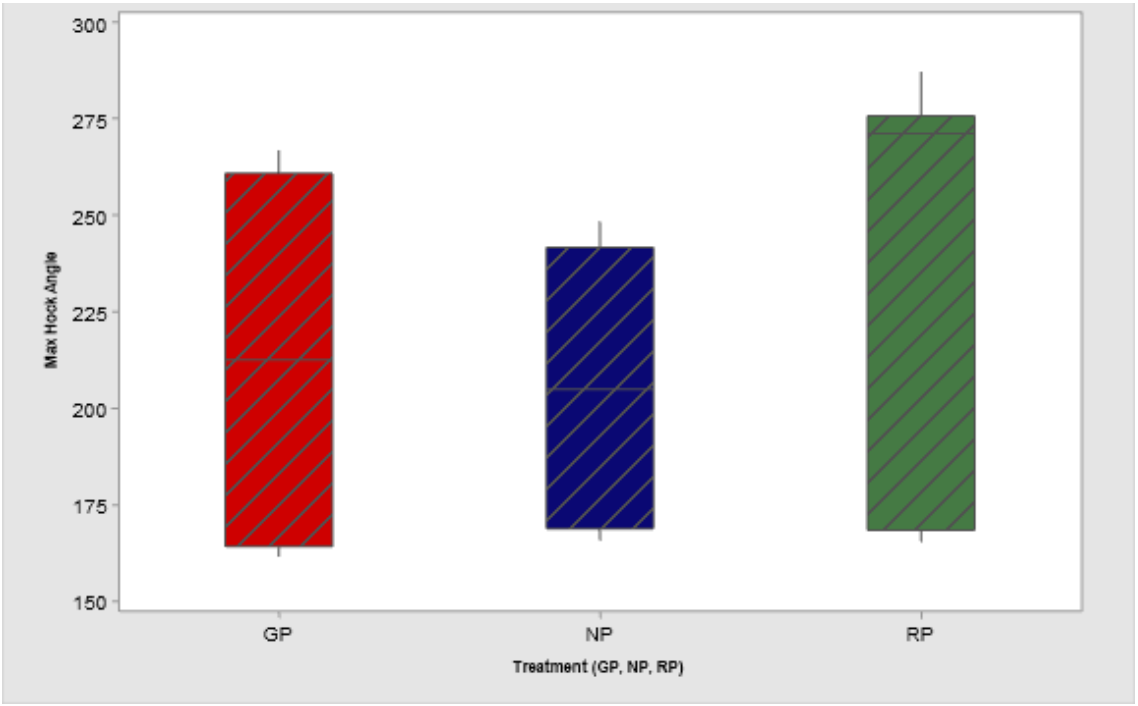

Figure 1: Maximum hock angles of horses working over ground poles, raised poles and no poles.

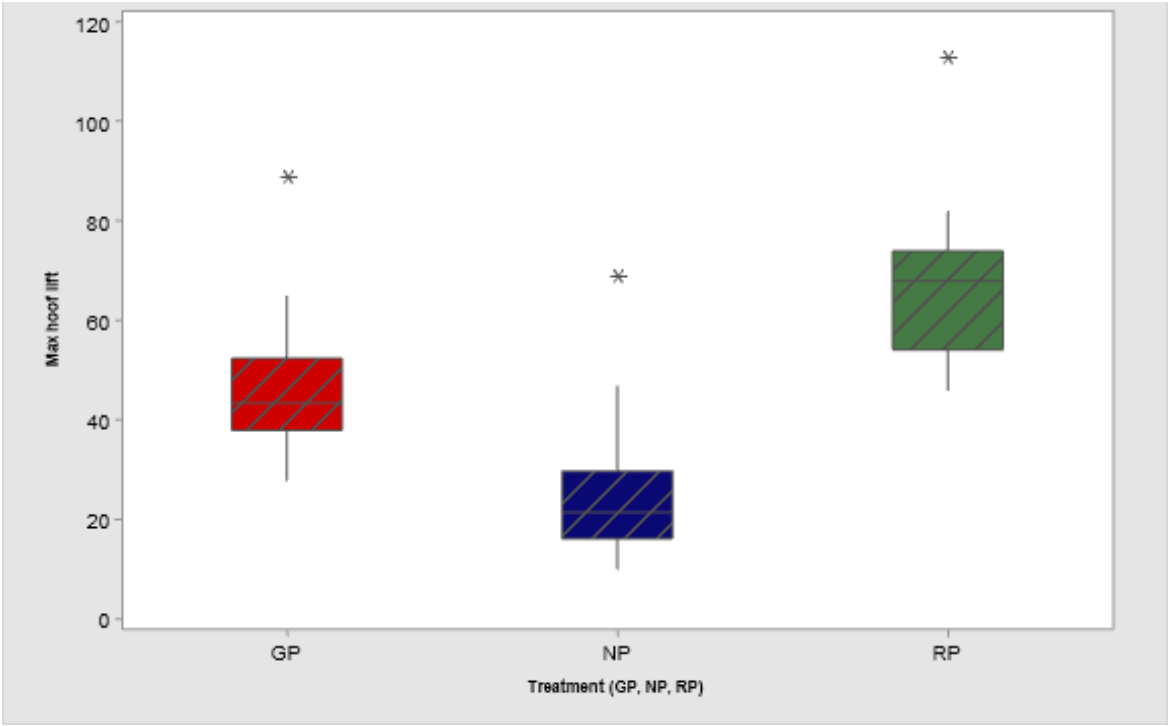

Figure 2: Maximum hoof lift of horses working over ground poles, raised poles and no poles

Discussion & Conclusions:

The results produced from this investigation were similar to the results of the previous research conducted. However, the present study's predominant focus was the hindlimb whereas previous studies focused on both the forelimb and hindlimb. This is because the hindlimb provides the power to horse's movement, which influences the horses overall kinematics to a greater extent than the forelimb. Furthermore, the present study utilized ground poles, raised poles and no poles to highlight the progressive increase in peak hoof height and hock angles which will influence the horse's kinematics. It can be concluded that the use of ground poles and raised poles does affect hindlimb range of motion and peak hoof height due to increased musculature effort to increase joint flexion to allow clearance of the poles Therefore, the null hypothesis can be rejected, and the alternative hypothesis accepted. This investigation provides further support of the effects of pole work providing industry with a scientifically supported exercise to improve joint range of motion and positively alter kinematics that is simple and inexpensive.

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Menstruation related issues in female horse riders

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Key words: Periods, Performance, Equestrians, Athletes

Introduction: Menstruation happens in most females, they live with their menstrual cycle on average from the age of 8 to 55, making it a major part of their life. The effect of menstruation on female equestrian performance, though, has received little to no research, unlike in other sports such as rugby, football and running as there has been proven to be an negative impact in their performance (Read et al., 2021). This is therefore an area requiring greater study, this study aimed to see if there was an impact in female equestrian's performance, due to menstruation.

Material & methods

Following institutional ethical approval from University Centre Sparsholt, a three-part, 22 question questionnaire (Google Forms) was completed by female equestrians (n=1080). This was distributed on social media, to females 18+ only, and based within the United Kingdom. The study was both for females currently having menstruation cycles as well as females who had gone through menopause. There were three parts with open and closed questions, these include, demographics, and pain/discomfort, followed by embarrassment and anxiety, lastly hormonal contraception. The tests utilised were Wilcoxon (W) and Mann Whitney to analyse associations between participants responses. There was also Chi squared tests utilised for this study as there was numerical data as well as categorical data.

Results: Twenty eight percent of participants said they felt embarrassed whilst riding on their period, 25% said they did sometimes. Riders stated that whilst on their period, 60% still compete, 21% said sometimes and 18% do not compete. By looking at the performance impact to the female equestrian, it was shown that there was a significant difference between when asking the participants if they felt their periods impacted their performance and if they were using hormonal contraception, this showed those using hormonal contraception had a reduced impact on their performance ($W= 250986$, $P<0.01$, Median difference= 3.5). Participants were asked whether they had ever felt embarrassment whilst riding on their period as a Yes or No answer, as well as if they had ever leaked whilst riding on their period. Those who leaked on their period had significantly reduced performance when riding compared to those who did not leak ($P<0.01$). When looking at hormonal contraception (HC), there was a significant difference ($P<0.01$) between pain levels in riders on/off HC which indicated improved comfort levels whilst on HC.

Discussion & conclusion: Menstruation does appear to have an impact in the equestrian's performance, this can mean that females utilising HC appear to have lower pain levels due to being able to alter when on their periods meaning they get less side effects and works better for them, however this needs further research to be confirmed. Self-consciousness has an impact in female equestrians and should be investigated further in the future, as 311 participants were embarrassed by the risk and actuality of leaking whilst on their period. Menstruation is an extremely under researched topic which happens in most females lives. This should be investigated in the future as it would be beneficial to the industry to look into biomechanics in the female athlete whilst riding on their period and see whether there is an impact on physiological and psychological aspects of the female equestrian, as this is clearly a subject that needs further investigation.

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The immediate effects of an equine physiotherapy intervention on spinal kinematics.

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Key words: equine, thoracolumbar, spinal kinematics, physiotherapy

Introduction: Thoracolumbar back pain and associated neuromuscular dysfunction is one of the most prevalent reasons for poor performance and behavioural issues in horses (Zimmerman *et al.,* 2012). Equine physiotherapy often uses appropriate physiotherapeutic interventions, with the aim to restore movement and function, subsequently to improve performance and welfare (McGowan and Cottriall, 2016). Currently, equine physiotherapy is often based on human research and evidence is lacking to support physiotherapeutic interventions in horses. The study aimed to investigate the immediate effects of a physiotherapy intervention, the sternal reflex, on dorsoventral (DV) range of motion (ROM) within the thoracolumbar region in horses.

Material & methods: Fourteen horses of mixed breeds (11 ±5.39 years) were fitted with eight inertial measurement units (IMUs) (Xsens, Enshede, Netherlands) to measure DV ROM, during sternal reflex repetitions. The IMU's were applied to the poll (C1-2), withers (T6), T13, L3, S3, right and left tuber coxae and the coccygeal. Each repetition was graded for movement quality and movement quantity by a qualified Association of Chartered Physiotherapists (ACPAT) physiotherapist (Luomajoki *et al*., 2008). Data was collected through Equigait™ software (Brickendon, Hertford, Hertfordshire, UK) from IMUs for each repetition. A Friedman's ANOVA was used to detect differences in DV ROM between individual repetitions. A Wilcoxon matched pairs test was used to test for differences in DV ROM between T13 and L3. A Spearman's rank correlation test was used to determine if there was a correlation between reflex scoring for movement quality and movement quantity against ROM. Significance level was set at $P<0.05$.

Results: There was no significant difference between individual sternal reflex repetitions for each horse at T13 or L3 ($p>0.05$) (Table 1). There was also no significant correlation between DV ROM and the reflex scores for movement quality and quantity. However, DV ROM was significantly higher at L3 compared to T13 ($p<0.001$).

Table 1: Mean dorsoventral ROM and standard deviation from all horses for each individual repetition at T13 and L3.

	Mean DV ROM T13 (mm)	s.d	Mean DV ROM L3 (mm)	s.d
Rep 1	74.92	3.59	76.40	2.92
Rep 2	74.37	4.89	76.12	4.26
Rep 3	74.13	2.39	75.68	1.70

Discussion & conclusion: Findings suggest that the sternal reflex exercise resulted in greater DV and flexion movement at L3 compared to T13, despite application of pressure below the mid- thoracic spine. Therefore, the sternal reflex was shown to have a DV mobilising effect on both the thoracic and lumbar spine. It also suggests that no further flexion is achieved by consecutively repeating the sternal reflex. Findings also suggest that there is no association between the physiotherapist grading and DV ROM at T13 or L3, although this was unsurprising as the physiotherapist was scoring global movements across the entire equine spine. A limitation of this study was that IMU's have not previously been validated for use statically in the horse and the inertial measurements are processed by the Equigait™ software to record cyclical motion signal. The sternal reflex induces a deviating movement pattern, therefore, only differential ROM can be interpreted and not the absolute ROM values. Further research would be valuable to determine absolute ROM values, effects on muscle activation and spinal stability to enable appropriate exercise selection in specific cases.

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Impact of toe clips and quarter clip shoes on the lamellar and skeletal structure in the foot of a horse.

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Key Words: Equine, Anatomy, Crena, Lamellar,

Introduction: A *crena marginis solearis* (crena) is a shallow notch in the distodorsal solar margin of the distal phalanx and the lamellar of the foot; the exact placement of a toe clip within the shod horse. Due to a paucity of research into this structural phenomenon, the purpose and aetiology of a crena is unclear at present. The aim of this study was to investigate the impact of toe clips and quarter clip shoes on the lamellar and skeletal structures in the equine foot.

Material & methods: In this study 35 equine cadaver forelimbs were examined; 12 were shod with toe clips, nine with quarter clips and 14 were unshod, at the time of death. The hooves were dissected to investigate the impact of shoes on the inner structures of the feet. The external demarcations of the hoof capsules were documented, and following the removal of the hoof capsule, demarcations at the level of the lamellar and the 3rd phalanx were noted and measured in centimetres. Any additional, observable damage to the capsules was recorded as notes in an Excel document.

Figure 1: Image showing the measurements recorded

Results: Of the 35 forefeet investigated, four did not have any discernible damage to the exposed lamellar structure, all of which were unshod limbs. Seven hooves presented with no damage to the 3rd phalanx; two of these being shod with quarter clips and five being unshod feet. Feet shod with

toe clip shoes had a significantly larger ($P<0.001$) indentation in the lamellar area, at a mean value of 0.67cm^2 compared to that of the unshod feet which had a mean 0.19 cm^2. Feet shod with toe clips also had a significantly ($P<0.001$) greater demarcation of the dorsal wall of the 3rd phalanx at the distal margin (crena / solear notch). The average area of bone missing from the distal margin within the shod foot was 0.30cm^2, compared to 0.08cm^2 within the unshod feet.

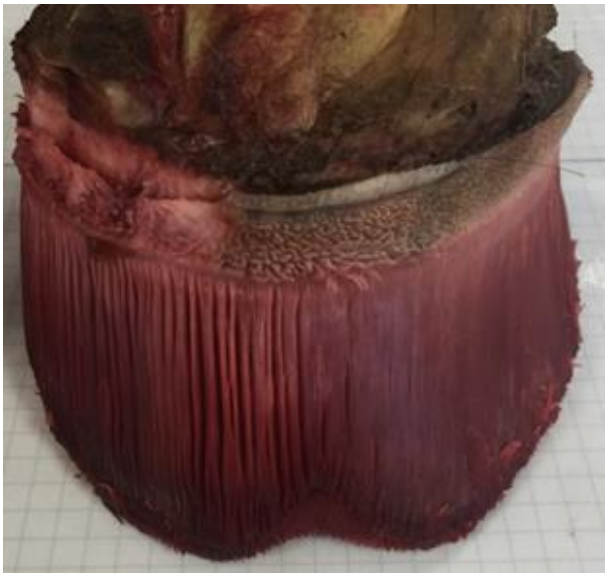

Figure 2: Image showing the demarcation to the distal margin at the lamellar level

Discussion & conclusion: The results from this study question previous suggestions that crena are naturally occurring and suggest that the prevalence and size of crena in horses shod with toe clips is greater than those either unshod or shod with side / quarter clips. Further research is needed to gain a more detailed understanding of the possible detrimental effect to the internal structures of the equine foot through the use of toe clips, however this highlights the potential for a significant welfare issue currently going unnoticed within common management practice and warrants further investigation.

Hock instability in the horse: relationship with pelvic symmetry and hindlimb muscle development.

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Key words: Hock; Instability; Muscle; Symmetry

Introduction: Excessive mediolateral (ML) hock oscillation or 'wobble' during locomotion is commonly associated with clinical issues. However, its presence has been reported within populations that are deemed clinically sound, with a suggestion it may be associated with hindlimb (HL) muscle weakness (Dyson et al., 2018). Yet, there is little investigation into factors affecting hock instability in sound horses. Objectives: To quantify the range of ML hock motion, and to identify associations between ML hock motion, pelvic symmetry and HL muscle development (MD) in walk and trot in sound horses.

Material & methods: 12 horses (age: 13±4 years) of mixed breeds with no known history of hock pathology were recruited. All horses were described as clinically sound by an ACPAT (Association of Chartered Physiotherapists in Animal Therapy) physiotherapist. Seven optical motion capture cameras (Miqus M3, Qualysis; 240Hz) captured data from horses walking and trotting on a high-speed treadmill (1.5±0.1m/s at walk and 3.2±0.1m/s at trot; 0% incline). Seven 19mm retroreflective markers were applied to each subject, over the midline between the *tuber sacrale*, *tubera coxae*, and the point of hock and lateral heel bulbs of both HLs (Figure 1).

Figure 1: Marker placement on the hindlimbs. Blue circles represent markers attached to tubera coxae, the midline between the tuber sacrale, and the caudal aspect of the point of hock and lateral heel bulbs of both hindlimbs.

Following a five-minute warm up, two 10 second walk and trot trials were recorded. ML hock motion was measured at walk and trot. Pelvic symmetry was measured at trot by calculating minimum (PDmin) and maximum (PDmax) position differences of the *tuber sacrale* marker between left and right stances; left and right stance was defined using hoof markers. One week later, a second ACPAT physiotherapist assigned MD scores of the *gluteus medius* (GM)*, biceps femoris* (BF)*, semitendinosus* (ST)*, semimembranosus* (SM) and *gracillis* (GR) of each horse (n=11) based on a previously published grading scale (Walker et al., 2016). SPSS was used for statistical analysis. A paired t-test identified differences in range of ML hock motion between walk and trot. Associations between ML hock motion, pelvic symmetry and HL MD scores were assessed using linear regression calculations. Significance was set at P=0.05.

Results: ML hock motion was greater in walk (66±13 mm) than in trot (31±6 mm) for all subjects (P<0.001). Pelvic symmetry showed no association with ML hock motion (P>0.05). The only muscle to show any relationship with ML hock motion was *biceps femoris*; in both directions, a lower MD score for BF was associated with greater oscillation of the contralateral hock during stance in walk (left BF/right hock: P=0.037; right BF/left hock: P=0.038). The relationship was not significant in trot (P>0.05).

Discussion: These findings suggest that hock instability cannot be used to identify pelvic symmetry but may be associated with less BF MD in the contralateral limb. It is therefore possible that increasing BF development could increase hock stability, so exercises that improve BF strength could be of benefit. This might include walking on an incline (Crook et al., 2010) or water treadmill training (Murray et al., 2020). ML hock motion is greater in walk than trot, therefore walk is likely to be the better pace in which to assess hock stability.

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Does discipline affect owner rugging practices of stabled horses

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Key Words: Rugging, Owner, Thermoregulation, Discipline

Introduction: Rugging has been common practice in the equine industry for hundreds of years, and as modern equestrianism has evolved, so have rugging practices (Mejdell, Bøe and Jørgensen, 2019; Brown and Twigg-Flesner, 2018). Horses developed from being a work force into performance athletes and so the care for them drastically changed to account for this, including the way they were rugged (Jørgensen, Mejdell and Bøe, 2020). The aim of this study was to investigate if there was a difference between discipline and rugging practices by owners of stabled horses. The owners used in this study were self-proclaimed amateur owners. This aim was obtained through a series of objectives that identified if the types of rugs used, level of knowledge and reason for rugging linked between disciplines. These objectives included: Identify the weights and styles of rugs used on stabled horses by owners of different disciplines, identify any link between owner knowledge of equine thermoregulation and owners of different discipline horses, identify rugging practices for reasons other than temperature by owners of different discipline horses

Materials & methods: A closed question questionnaire was put out through social media to gain data and had a high response rate (n=6139). The questionnaire gathered data from different disciplines including dressage, show jumping, eventing, leisure, showing and a category for collective other disciplines. Both affiliated and unaffiliated levels were assigned to the same overall category to group the data more easily. Level of thermoregulation knowledge was attained using questions with scientifically supported correct answers, such as “What is the maximum temperature a horse should be exposed to under their rug (maximum air temperature under the rug)?” Once completed the data were analysed using SPSS and analysed using a Kruskal Wallis Independent Samples Test and a Bonferroni Post Hoc Test for difference for between discipline analysis.

Results: The data showed multiple significant differences between the responses of the different disciplines for rug types used and so the different disciplines had used different rugs in different scenarios. In a post hoc test for between discipline analysis, there was a common P value of <0.05. The most common and recurring differences were seen between the Leisure and Other categories, which also happened to be the largest categories. Table 1 shows the percentages of results from one of the Scenario questions (Question 24: “*Your horse is stabled during the night the weather forecast is saying there will be light winds at a temperature of 8°C, which rug would you choose for your horse?”)* to show the difference in data spread.

Table 1: Rug choice at 8°C

	Dressage (722)	*Show Jumping (499)*	*Eventing (647)*	*Leisure (2466)*	*Showing (146)*	*Other (1659)*
No Rug	*95 (13.2%)*	*39 (7.8%)*	*40 (6.2%)*	*801 (32.5%)**	*23 (15.8%)*	*802(48.34%)**
Sheet	*132 (18.3%)*	*58 (11.6%)*	*87 (13.4%)*	*480 (19.5%)*	*24 (16.4%)*	*218(13.14%)*
100g	*211 (29.2%)*	*146 (29.3%)*	*219 (33.8%)*	*567 (23%)*	*35 (24%)*	*295(17.78%)*
200g	*185 (25.6%)*	*154 (30.9%)*	*193 (29.8%)*	*401 (16.3%)**	*43 (29.5%)*	*182(10.97%)**
300g	*59 (8.2%)*	*58(11.6%)**	*65 (10%)**	*82 (3.3%)*	*13 (8.9%)*	*53(3.19%)*
400g	*20 (2.8%)*	*23 (4.5%)*	*25 (3.9%)*	*25 (1%)*	*1 (0.7%)*	*14(0.84%)*
500g	*3 (0.4%)*	*8 (1.6%)*	*3 (0.5%)*	*0 (0%)*	*0 (0%)*	*7(0.42%)*
600g	*2 (0.3%)*	*1 (0.2%)*	*2 (0.3%)*	*4 (0.2%)*	*2 (1.4%)**	*3(0.18%)*
Other	*15 (2.1%)*	*12 (2.4%)*	*13 (2%)*	*106 (4.3%)**	*5 (3.4%)*	*85(5.12%)**

*p<0.05

There was a similar level of knowledge on equine thermoregulation between all disciplines due to similar responses. Due to the simplicity of the questions and lack of specific scientific knowledge needed to answer the questions, it was assumed all disciplines held a basic level of knowledge on equine thermoregulation as shown in Question 37 *("What is the maximum temperature a horse should be exposed to under their rug e.g. maximum air temperature under the rug?"*). The results below (Table 2) with similar, cross discipline answers shown in bold.

Table 2: Maximum under rug temperature

Temp (˚C)	*Dressage (722)*	*Show Jumping (499)*	*Eventing (647)*	*Leisure (2466)*	*Showing (146)*	*Other (1659)*
25	***239(33.1%)***	***138(27.7%)***	***185(28.6%)***	***678(27.49%)***	***37(25.34%)***	***456(27.49%)***
26	*24 (3.3%)*	*21 (4.2%)*	*19 (2.9%)*	*60 (2.43%)*	*2(1.37%)*	*32(1.93%)*
27	*15 (2.1%)*	*27 (5.4%)*	*23 (3.6%)*	*49 (1.99%)*	*8(5.48%)*	*39(2.35%)*
28	*8 (1.1%)*	*13 (2.6%)*	*12 (1.9%)*	*33 (1.34%)*	*2(1.37%)*	*19(1.15%)*
29	*1 (0.1%)*	*0 (0%)*	*0 (0%)*	*1 (0.04%)*	*0(0%)*	*0 (0%)*
30	*6 (0.8%)*	*0 (0%)*	*7 (1.1%)*	*7 (0.28%)*	*0(0%)*	*8 (0.48%)*
Don't know	***366 (50.7%)***	***269 (53.9%)***	***363 (56.1%)***	***1136 (46.07%)***	***80(54.79%)***	***888 (53.53%)***
Other	*63 (8.7%)*	*31 (6.2%)*	*38 (5.9%)*	*262 (10.62%)*	*16(10.96%)*	*217 (13.08%)*

The results from the thermoregulation questions showed that the general equine industry responded with the correct scientific answers and all disciplines answered in a similar manner to

each other. Different disciplines rugged for different reasons between each other. In multiple questions in the questionnaire, owners were offered a space to comment why in certain situations they may rug in different ways. Wet rugs, extreme changes of temperature and weather conditions were common reasons for differentiations in rugging practices, seen across disciplines, therefore not in keeping with the primary finding of different disciplines having different rugging practices.

Discussion & conclusion: Some limitations were found whilst carrying out the questionnaire. Firstly, adaptations were made to the questionnaire after it had already been submitted to the public meaning that there may have been some participants who were unable to give the answer they desired. Furthermore, due to the questionnaire being mainly comprised of closed questions, there was not space to allow an explanation by the participants which may have led to the incorrect assumption being made. In conclusion, different disciplines participated in by the owner does change the rugging practices, however it was unclear if discipline was the clear deciding factor of the outcome due to some limitations seen within the questionnaire. Future studies are recommended to provide an in-depth view into the rugging choices of the different disciplines to see if there are any other factors that may affect this. More research should also be conducted to understand the extent of owner knowledge on equine thermoregulation and thermo comfort.

How do equine hindlimb biomechanics respond to massage gun therapy in comparison to manual therapy in trot

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Key words: Equine, Horse, Massage Gun, Therapy

Introduction: Equine musculoskeletal injury is a primary reason for shortened athletic careers with 34% of all injuries being predisposed to the hindlimbs (Singer *et al.*, 2008). Accordingly, the practical application of massage gun (MG) devices has increased in popularity within athletic performance and therapeutic rehabilitation, with the aim of enhancing tapotement and deep massage therapy (Germann *et al.*, 2018). The aim of this study is to investigate the effects of a MG treatment to the proximal hindlimb muscles on hindlimb protraction, retraction, and active range of motion (ROM), in the trotting horse.

Materials & methods: A cross-over study design was selected with a 1-day washout period. Six horses were randomly divided into two groups of three. Both groups were subject to a 10-minute warm-up. On day one, horses in group MG received a MG treatment followed by a 1-day washout period and on day two the horses were subject to the control treatment. Horses in group C received the control treatment on day 1. Following this, group C was also subject to a 1-day washout period and on day 2 the horses received the MG treatment.

Each horse received a 20-minute MG treatment applied to the proximal hindlimb muscles (10 minutes each side), which was intersected into two minutes 30 seconds for each muscle. Firstly setting 2 (40hz) was used for 1 minute followed by setting 3 (53hz) for the remaining 1 minute 30 seconds. The MG was applied in muscle fibre direction targeting the m. *Gluteus medius, m. Biceps femoris, m. Semitendinosus and m. Tensor fascia latae*. The control treatment consisted of a 20-minute effleurage massage applied in fibre direction for a duration of 10 minutes each side to the proximal hindlimb muscles. The massage was intersected into two minutes 30 seconds for each muscle. The effleurage was applied to the m. *Gluteus medius, m. Biceps femoris, m. Semitendinosus* and m. *Tensor fascia latae.* Anatomical markers were applied to the tuber coxae, cranioventral aspect on the greater trochanter of the femur, lateral femoral epicondyle, talus, lateral metatarsal epicondyle and the coronary band. The track was outlined by two poles measuring 3.36 m whereby three consecutive trot passes were recorded pre and post treatments using a high-resolution camera at 240 fps. Objective hindlimb kinematic data were collected via the use of Quintic Biomechanics v.31 (Quintic Consultancy Ltd, Birmingham, UK). To assess right hindlimb ROM within a full stride, stride length was determined by the initial ground contact of the first stride to the initial ground contact of the second stride. Using Quintic Biomechanics v.31, auto-tracking and tracking was used to gather digitised figures which was then converted into angle data. This enabled the maximum flexion and extension angles to be determined, then the use of Microsoft Excel allowed

range of motion to be calculated. Results were analysed through SPSS using Shapiro-Wilk normality test, paired t-tests for parametric data (HL retraction- C and MG; Hip ROM- C and MG; Stifle ROM- MG; Hock ROM- C and MG; Fetlock ROM- C) and a Wilcoxon's Ranked for non-parametric data (HL protraction MG and C; Stifle ROM-C; Fetlock ROM-MG). Significance was set as $p<0.05$.

Results: The results of this study confirmed that the MG treatment and control effleurage treatment increased hindlimb protraction significantly ($p= 0.028$). Accordingly, the percentage improvement of hindlimb protraction after the massage gun treatment was 9.7% greater than after the effleurage treatment. However, no significant difference was obtained when treatments were compared ($p=0.753$), suggesting the MG has similar effects to effleurage massage. With regard to hindlimb retraction ($p= 0.59$), hip ($p= 0.89$), stifle ($p= 0.23$), hock ($p= 0.07$), and fetlock ROM ($p= 0.46$), this present study identified that there was no statistically significant difference after the MG treatment or control effleurage treatment ($P= >0.05$).

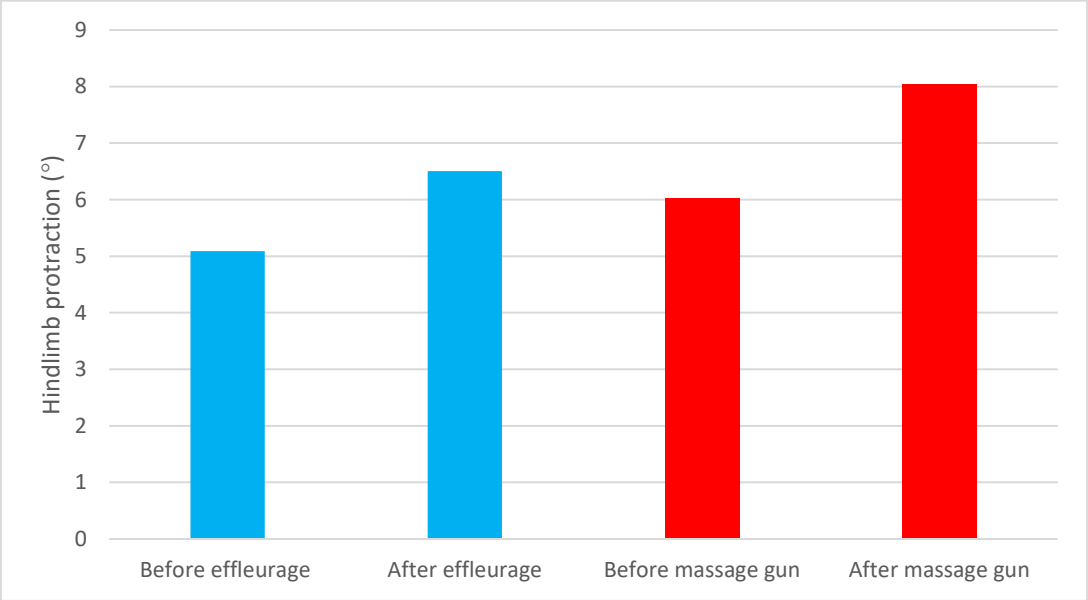

Figure 3: Median hindlimb protraction before and after the control group and treatment group, measure in degrees (°).

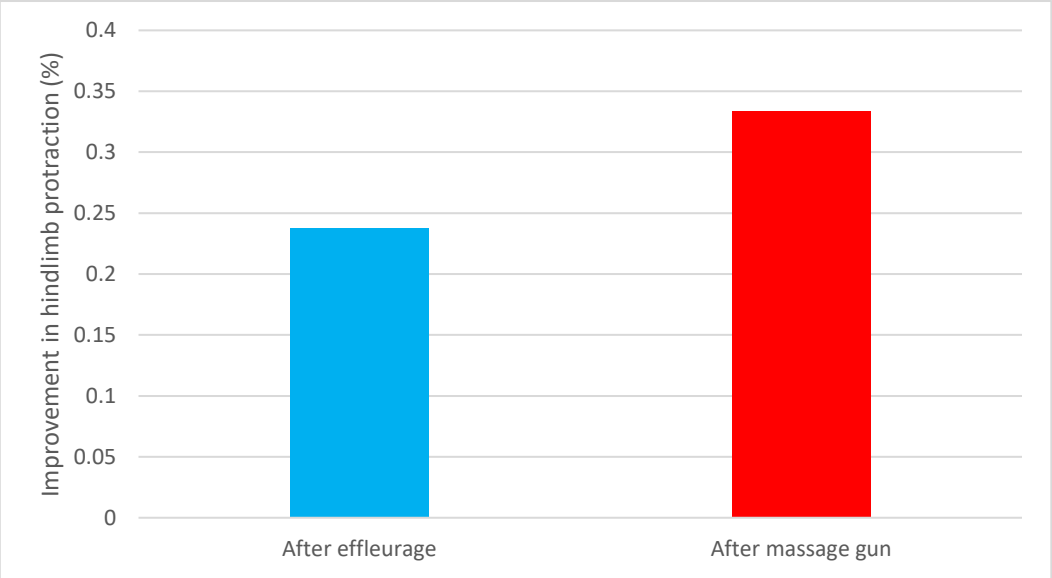

Figure 4: The percentage improvement in hindlimb protraction illustrated by the median for the control and treatment group.

Discussion & conclusion: The muscles targeted within this study were hindlimb extensors, therefore, the rapid bursts of mechanical pressure may have increased the compliance of the muscle tissue, improving extensibility, thus enabling the limb to achieve greater protraction (Patel and Patel, 2020; Weerapong *et al.*, 2005). . Accordingly, the MG is suggested to have similar effects to effleurage massage. In conclusion, results of this study suggest that the rapid bursts of mechanical pressure may have increased the compliance of the muscle tissue, improving extensibility, thus enabling the limb to achieve greater protraction, as the muscles targeted within this study were hindlimb extensors. Therefore, this can be implemented during equine rehabilitation or as a maintenance for optimal performance, necessary for competition.

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Could it be lameness? Horse-owner decision making and prevalence of equine lameness in the UK

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Key words: lameness, prevalence UK, horses' owners

Introduction: Lameness is the leading cause of injuries and poor performance in horses globally, yet factors associated with prevalence are not consistent among researchers. Owners play an essential role in the processes of recovery; by having their horse insured, seeking veterinarian for diagnosis and treatment, during management and rehabilitation. Although not all horses are insured due to economic implications, impacting veterinarian ability to provide gold standard treatment. Hence, the horse's age, breed, discipline and level were analysed to identify a correlation point with lameness grade. Similarly, if a relationship exists between owner's decisions making such as if veterinarian was called out and recovery rate.

Material & methods: An online questionnaire targeting equine's owner was promoted through Facebook. Data gathered included demographic data, then horses' details, lameness diagnosis and treatment protocols and owner's perceptions, injury management and recovery. Of the 185 participants, 140 met the inclusions criteria. Data was analysed using SPSS (IBM-26) and Excel for descriptive analyses. All variables were tested for normality. Non-parametric tests used were Kruskal-Wallis, and Mann-Whitney U-test for difference between sample populations, horses and horses' owners, and Spearman's rank test for an association between grade of lameness and horse's age group.

Results: Horse's age group impacted lameness prevalence with 10-15,16-20 years having the larger scale of lameness grade with a mean of 3 in contrast to older horses 21-27 years having a mean of 2 (Figure1), however no statistical significance was found due to the sample population observed. Furthermore, insurance cover was statistically significant on veterinarian call out, P=0.016; with 60% of horses insured, among which 86% had a diagnosis and treatment protocols conducted by a veterinarian, under their insurance policy. In contrast, non-insured horses had lower percentage, 66% owners calling veterinarians for diagnosis and treatment, and 20% not seeking veterinarians.

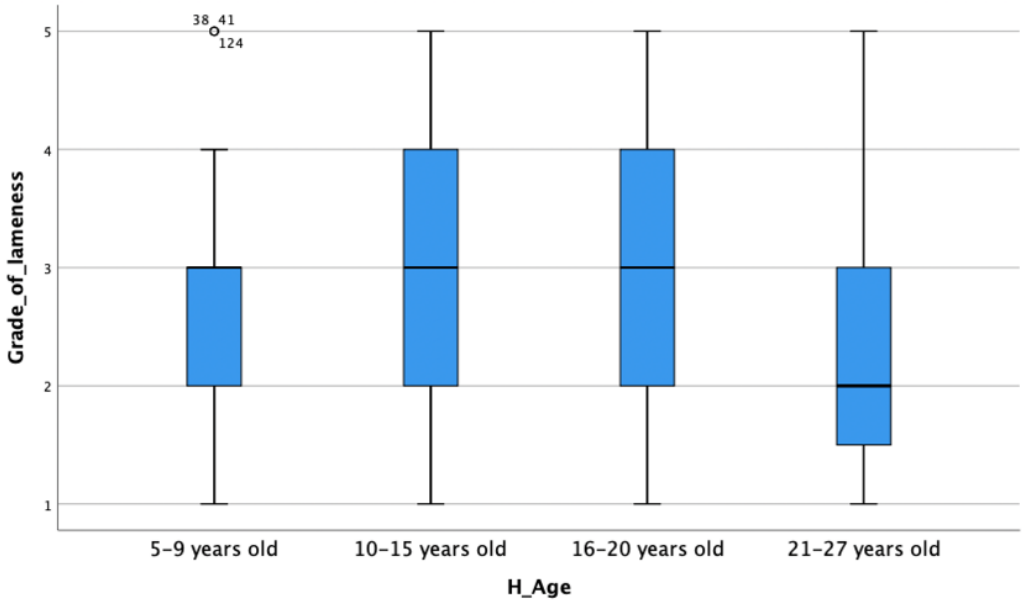

Figure 1: Distribution grade of lameness per age group of horses

Discussion & conclusions: Similar results were observed in a UK based research including 1131 horses; 6-9 and 10-15 years had P<0.01 compared to >15 years P=0.375 between horse' age and lameness grade, implying an increase in prevalence with horses in work (Parkes, Richard Newton and Dyson, 2013). Although this result should be interpretated with caution given the width of the ages group. Research into incidence of lameness in relation to age groups, is stagnant over the years, indicating insignificant improvement of horses' management during training. According to Williams et al. (2016), pet health insurance is expected to increase pet owners' willingness to treat unexpected health issues in their pets, allowing them to avoid costly hospitalisations, also observed in this study with lameness. Owners decision making directly impact equine welfare with the economical implication of veterinarians fees; therefore veterinarians should suggest insurance cover to reduce delay or absence of treatment in case of injury (Kipperman, Kass and Rishniw, 2017). The result of this study highlighted factors increasing the prevalence of equine lameness and suggest that some progress is yet to be made in this direction.

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The Effects of a Stretching Regime on Stride Length and Hindlimb Range on Motion in the Equine Canter.

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Key Words: Horse, Physiotherapy, Performance, Therapy

Introduction: Passive stretching is a commonly used practice among humans and equines in order to increase joint ROM, increase stride length, decrease the risk of injury, and reduce pain. Rose *et al*., (2009) concluded that stride length was not altered by either a 3-day or 6-day stretching regime in horses, however the 3-day stretching regime benefited the horses more than the 6-day regime when increasing joint range of motion. The aim of the study was to compare stride length and hindlimb joints range of motion at canter before and after completing a four-week stretching regime.

Material & methods: Seven horses were randomly assigned into two groups: a stretching group (4 horses) or a control group (3 horses). The stretching group underwent a regime where they completed four stretches on each hind limb three times a week for four weeks. Stretches included hindlimb protraction, retraction, abduction, and adduction stretches. One repetition of each was completed and hold times increased throughout the trial from 10 seconds up to 30 seconds. High-speed videos were collected before (W0) and after (W4) stretching programme during canter. A speed gate was used to keep speed consistent between trials, keeping a maximum variation of 0.5m/s. Range of motion of hindlimb joints (hip, stifle, hock and fetlock) and stride length were obtained on a gait analysis software (Quintic Biomechanics v.31, Quintic Consultancy, Bristol, UK). Change scores (absolute difference between W0 and W4) of outcomes was calculated within each group ((W4-W0). SPSS was used for statistics analysis. Shapiro-Wilk test of normality has identified that data was of parametric distribution. Therefore, independent samples t-test was used to determine differences between groups (absolute change scores) and paired t-test was used to determine differences within the group (W0 vs W4).

Results: Mean (+SD) of all outcomes are presented on table 1. Stride length increased within both groups; however, a higher increase was seen in the stretching group (0.56±0.55m) than the control group (0.22±0.13m). The improvement of stride length had a non-statistically significant difference, $t(5) = 1.01$, $p = 0.36$ (Figure 1). There was no significant improvement in range of motion (ROM) of the hip, stifle, hock and fetlock, when comparing before and after within each group or when comparing between groups ($p>0.05$). Nonetheless, a trend in improvement of stifle ROM has been seen on the stretching groups, whilst the stretching programme seemed to have a negative impact on hip, fetlock and hock ROM, although not statistically significant.

Table 1: Mean (±SD) of kinematics variables of horses receiving (stretching group, n=4) or not (control group, n=3) a 4-week stretching programme. Values were collected at the beginning (W0) and after 4 weeks (W4)

Variable		W0	W4
SL (m)	*Stretching group*	2.55±0.29	3.11±0.41
	Control Group	2.51±0.15	2.74±0.26
Hip ROM (°)	*Stretching group*	44.67±15.85	38.10±4.05
	Control Group	41.57±7.93	39.15± 6.79
Stifle ROM (°)	*Stretching group*	49.77±15.97	33.49±5.80
	Control Group	35.09±11.32	44.93±11.64
Hock ROM (°)	*Stretching group*	54.43±3.06	51.66±0.82
	Control Group	42.01±5.44	46.32±6.92
HL fetlock ROM (°)	*Stretching group*	105.83±26.86	111.13± 10.96
	Control Group	100.44±10.07	107.68±17.44

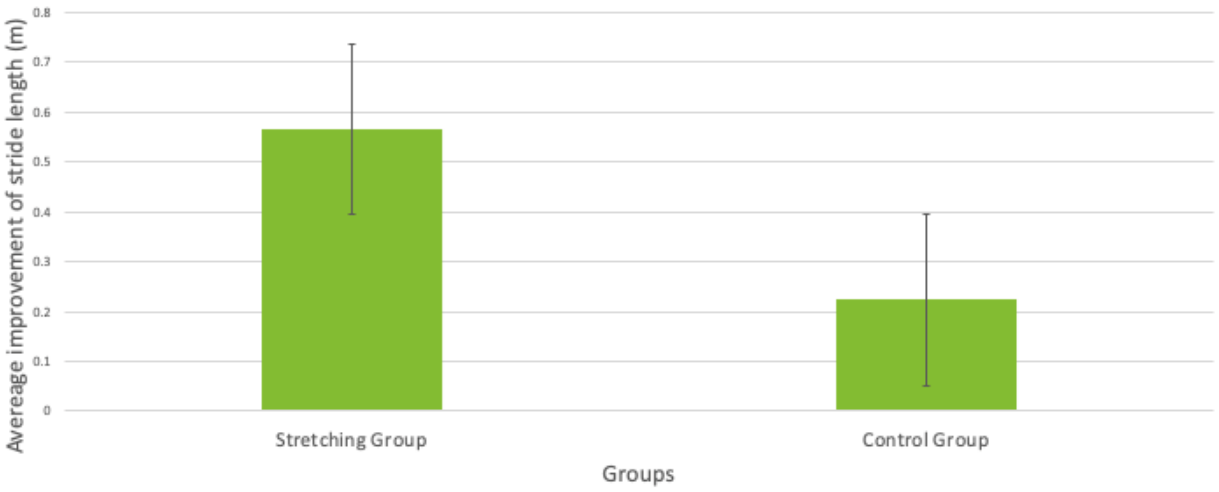

Figure 1: The average stride length in m of the stretching group before and after the 4-week stretching regime

Discussion and Conclusion: Overall, it has appeared that stretching three times a week has shown some trends in modifying stride length and stifle ROM, although non-statistically significant, but can also have some negative impacts on performance. Our findings agree with Rose *et al.* (2019); however, more research needs to be done surrounding the optimal frequency and times of stretches, and how long a stretching programme needs to be carried out for the beneficial effects be apparent.

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The behavioural anticipatory response displayed by event horses at the cross-country start box.

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Key words: Equine; ridden behaviour; anticipation; eventing

Introduction: Anticipatory responses are related to previous experiences associated with presented stimuli, as animals can learn to pair a cue with a likely outcome (Watters, 2014). Heightened arousal in anticipation of the cross-country has anecdotally been observed for event horses whilst around the start box. However, over arousal is associated with unwanted behaviours, such as head and neck movements, rearing, shying and uncued whole body movements which, if prolonged, leads to mental and physical fatigue for both horse and rider (Peeters *et al*., 2013). Thus, to minimise this it is important to identify factors that influence the occurrence of anticipatory behaviours. However, little is known about the anticipatory responses or associated behaviours in ridden equines. Therefore, this study aimed to explore the type and frequency of anticipatory behaviours linked to arousal shown by event horses whilst around the start box before the cross-country phase.

Material & methods: A video camera set up with a view of the start box recorded a systematic sample of 30 horses across the 2-,3- and 4* classes competing on cross-country day at Hartpury Horse Trials 2021. An ethogram of anticipatory behaviours was created from existing literature and focal continuous sampling was used to record the cumulative behavioural frequency displayed by each participant. A Cohen's Kappa tested for inter-observer reliability with a good level of agreement ($k=0.695$, $P<0.001$). Microsoft Excel and IBM SPSS (version 26) were used for data analysis. A Shapiro-Wilks test revealed non-parametric data thus, a Spearman's correlation was used to determine associations between the total frequency of anticipatory behaviour and the previous number of cross-country phases the horse had started. A Kruskal-Wallis test identified differences in the frequencies of behaviours shown between the 2-3, and 4* classes ($P>0.05$).

Results: Nearly all (96.7%) of participants displayed an anticipatory response most commonly gaping, jogging and head tossing (Figure 1) with more of these behaviours displayed by two-star horses compared to the three and four-star horses, although differences between classes were non-significant. Figure 2 suggests the level of competition may affect the anticipatory response shown around the start box ($P=0.074$).

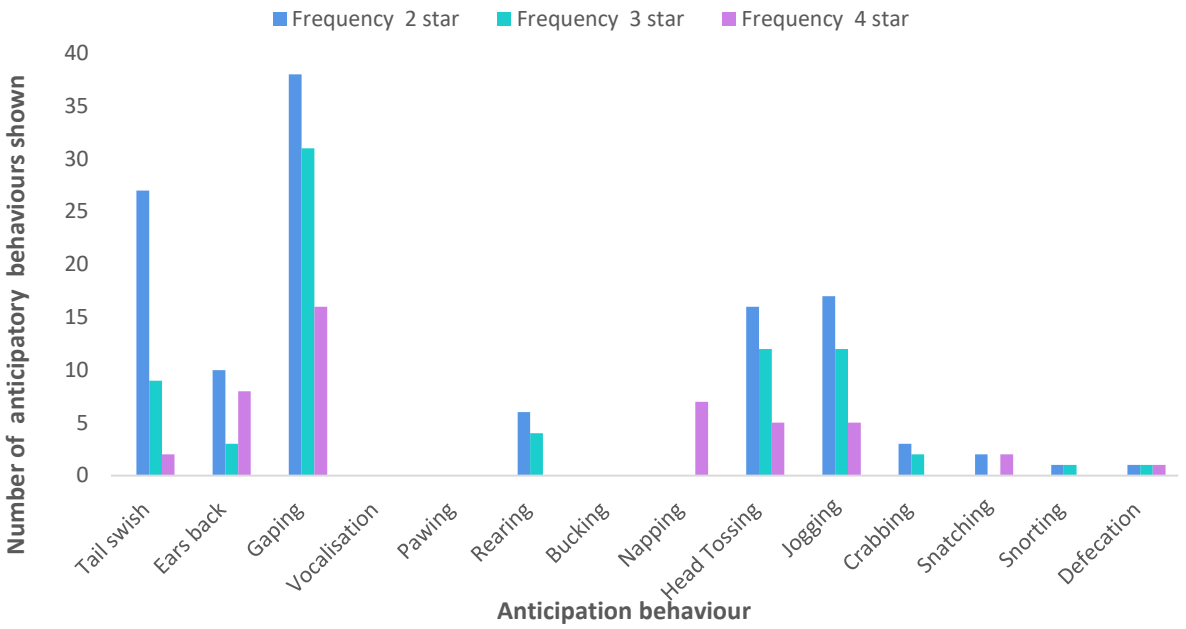

Figure 1: Cumulative frequency of different behaviours shown in the 2-3- and 4* classes.

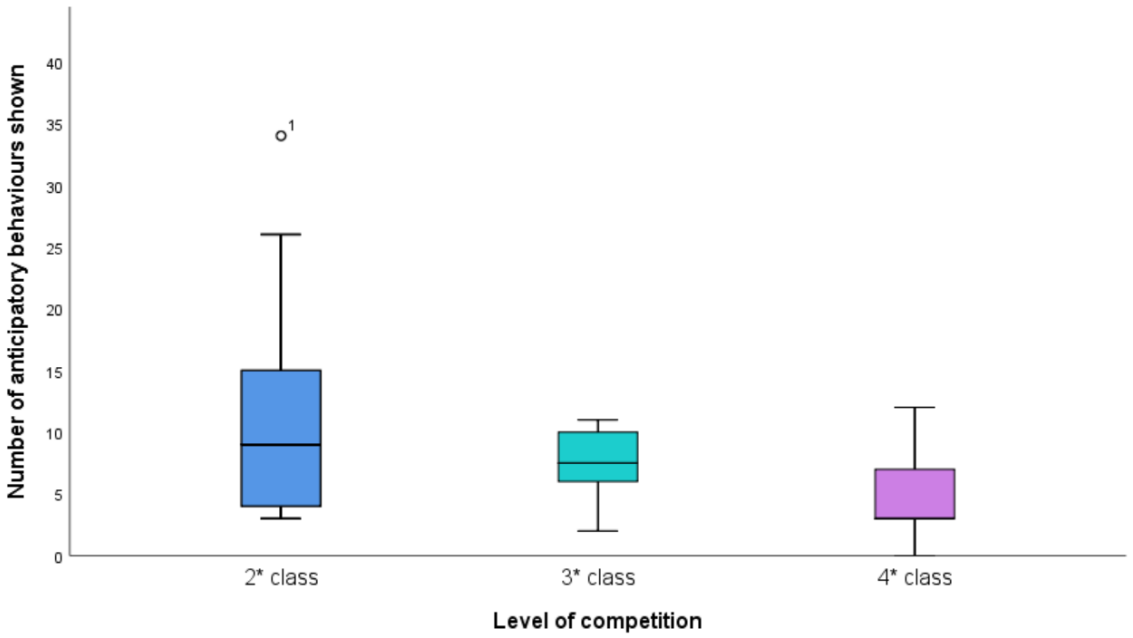

Figure 2: Difference in the frequency of anticipatory behaviours between the 2-,3- and 4* classes. Boxes represent medians and interquartile ranges; whiskers represent the range and individual points outliers.

Whilst a significant difference (P=0.004) was apparent between the number of previous events completed and the level of competition, a non-significant negative relationship (P>0.05) was detected between competition experience and frequency of behaviours shown (Figure 3).

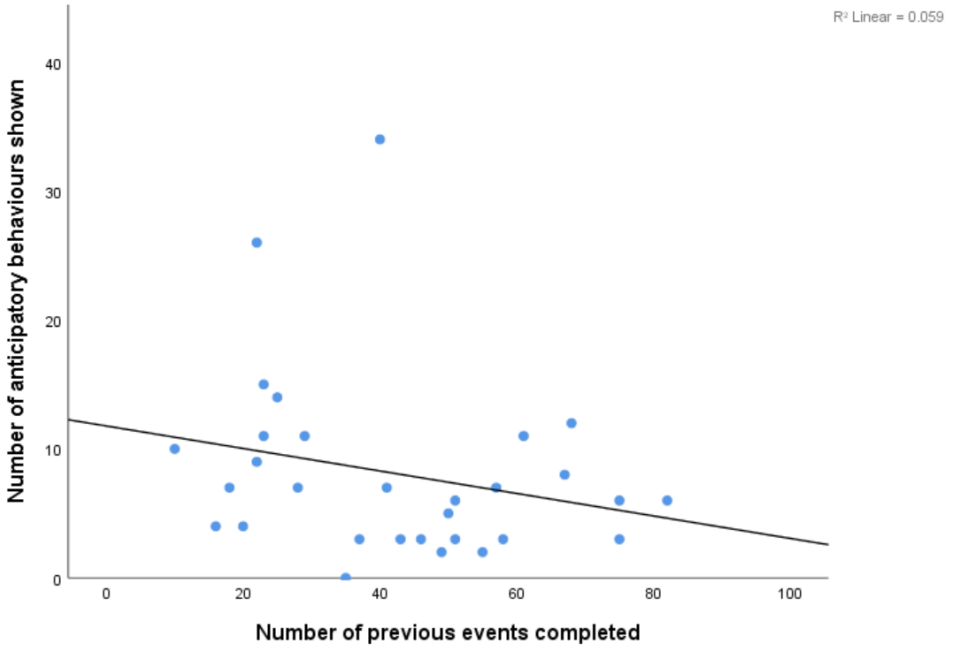

Figure 3: Correlation between the frequency of anticipatory behaviours shown and number of events previous events completed. The blue dots represent individual data points, the black line is the best linear predicted fit.

Discussion & conclusions: A trend towards fewer behaviours being shown, as competition level increased could have resulted from increased rider ability or horse experience. However, the 4* class ran as a one-day event format, not three-day, potentially increasing horse fatigue from already enduring two phases of competition and reducing the frequency of behaviours displayed by these horses. The negative correlation between the number of previous events and frequency of anticipatory behaviours displayed could be linked to the number of times the horse has previously been exposed to the start box. In all cases however individual temperament and rider ability may also impact on anticipatory behaviour.

This preliminary study provides an insight into the anticipatory response displayed by event horses around the start box. Future research is required to confirm these findings are not down to chance and to validate the behaviours as anticipatory. The application of this research would be valuable in developing rider understanding and training strategies to prevent over-arousal before the cross-country and safeguard event horse welfare.

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The Prevalence of Stem Cell Therapy in Horses

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Introduction

Within the equine industry over-strain induced injuries are a significant source of career ending and financial losses (Paris et al., 2012). The understanding of use of stem cells in practice will lead to an increased understanding of their benefits, an increased knowledge of stem cell applications and success from follow-ups used to determine their long-term effectiveness. Investigation of patterns of use in horses encountering injury, both treated and non-treated by stem cell therapy will determine the long-term effects and determine the evidence of particular stem cell therapy benefits. Despite widespread use there are few reports showing long term clinical data. The aim of this study was to determine prevalence pattens within the use of stem cell therapy in practice, for example which injuries they are most commonly used for, and the success rates associated to individual types of injury which would be determined by the horse returning back to their original workload and potential reduced re-injury risk.

Method: A questionnaire was created using Microsoft Forms to gather horse demographic information, the injuries and treatment undergone. This was distributed onto social media platforms such as Facebook for a total of 7 weeks. During this period results were obtained from 180 participants. Four of these responses were disregarded due to the lack of valuable data provided. 176 of these responses were determined to be appropriate and analysed.

The Chi Square Test was used to test statistical significance between variables. Overall, the use of stem cell therapy was not statistically significant in successful recovery after treatment. A statistically significant link was determined in reduced re-injury with stem cells (P= 0.013).

Results: Overall stem cell therapy was used in 37 cases (21%) and other treatment options were used in 139 cases (79%) to treat injuries that participants had incurred previously. Successful recovery, within the questionnaire was classed as horses that now, post injury, treatment and recovery, performing the same or increased level of workload prior to injury occuring. f the 37 horses that underwent stem cell therapy 27 of them (72.97%) have shown successful recovery, 7 of them (18.92%) have not completed the recovery period. A further 3 (8.11%) horses have not returned to previous workload, although only one of of these (2.70%, n= 1) having experienced re-injury, while the remainder (n= 1) are now in a reduced level of work and retired (n= 1).

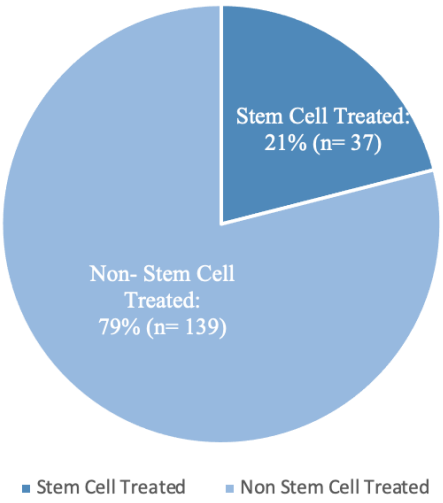

Figure 1: The overall prevalence of stem cell therapy in the study sample (n=176)

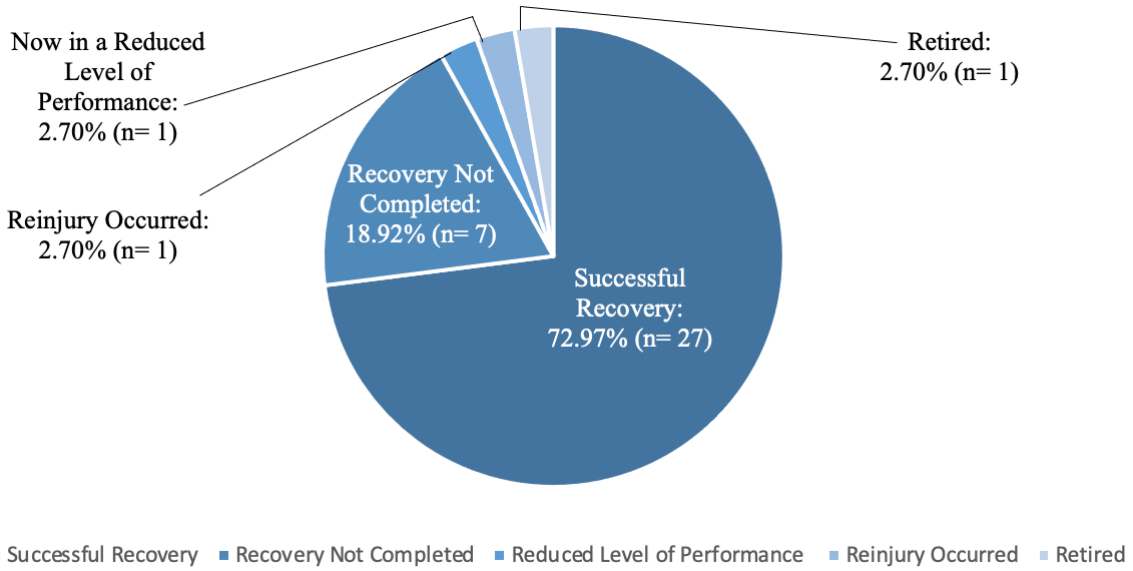

Figure 2: The overall outcomes of those treated using stem cell therapy (n=37)

Discussion & Conclusion

This study supports previous data collected despite the limited sample size and demographic variety, concluding that stem cell therapy may aid in the recovery of horses being treated for injuries with reduced healing properties such as tendons, ligaments and joints. The benefits reduced the reinjury rates compared to other treatment options that were identified by participants. This study highlights the need for further investigation into the rehabilitation phase of recovery due to the cumulative effect, to reduce the risk of re-injury for both elite and non-elite horses.

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The effects of plaiting on stress and scoring in dressage horses: a preliminary study

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Key words: *plaiting; stress; horse; dressage*

Introduction: Plaiting is common practice in dressage competitions. Nevertheless, it has not been questioned before; with evidence of tight braiding being harmful to humans, and other equine husbandry procedures, such as mane pulling, being stress inducing (Hovey *et al*., 2021), the possibility of plaiting posing a welfare issue exists. The aim of this study was therefore, to investigate whether plaiting evokes changes in heart rate (HR) and behavioral data in horses pre, post and during exercise, impacting performance and welfare.

Method: Six horses (mares = 3; geldings = 3) of varied breeds, a mean age of $12.\overline{6}$ years and different competition levels (BD Preliminary = 2; BD Novice = 2; BD Elementary = 2), were observed in a cross-over manner; one day being plaited and performing a dressage test and another day, performing the same test unplaited. Data was collected during the plaiting procedure, warm-up, dressage test, and cool-down; HR was collected using a Polar Equine Belt, behavioral data was gathered using an ethogram and a qualified judge scored the combinations on both days as part of an online dressage competition. The force applied by each plaiter was measured using a Fish-Hook Scale. Statistical analysis was performed using IBM SPSS 26. A Paired Samples T-Test was used to test for differences comparing each horse's plaited and unplaited data, and Day 1 and Day 2 data; an Independent Samples T-Test for differences between sexes, plaiters and presence/lack of hay during the procedure; a Kruskal-Wallis Test for differences in breeds and competition levels; and a Spearman's Rank Correlation to test for age-related correlations.

Results: No significant ($P<0.05$) results were found, with exception of the effect of sex on Day 2 (P=0.016). However, a comparison in *means* showed that, to some extent, when plaited, horses presented lower HR values in all instances (up to a 39.17 bpm difference), except maximum cool-down HR and minimum baseline HR; fewer conflict behaviors (by 5.91%); and lower dressage scores (by 0.82%), this was a combination of both plaiters. In comparison, horses plaited by Plaiter 2, who exerted more force, also reflected less stress cues and decreased performance. Looking into presence of hay during plaiting revealed that with hay, horses, presented less conflict behaviors (by 43.02%). Additionally, mares presented higher HR values and geldings, higher amount of conflict behaviors, in all instances.

Discussion & conclusion: In essence, no negative effects of plaiting were observed, however, there is a possibility that the pressure applied was tension-relieving as it could present similarities to allogrooming, and not enough to evoke stress responses in horses habituated to the procedure (Normando *et al*., 2003). According to the Yerkes-Dodson law, more arousal than this may also be

needed for optimal performance (Mendl, 1999). This study was mainly limited by its sample size, which may have influenced significance, and horses being used to plaiting. Further research could focus on collecting questionnaire-based information on plaiting practices or measuring how long it takes horses to habituate to this process, and whether at higher pressures it is stress inducing, possibly utilizing von Frey filaments.

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A quantitative investigation into the prevalence of thoracolumbar pain in the horse and factors relating to Impinging Dorsal Spinous Processes

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Key words: thoracolumbar pain, Impinging Dorsal Spinous Processes (IDSPs), horse, kissing spines

Introduction: Thoracolumbar (TL) pain in horses is highly prevalent across athletic and leisure equine populations and was reported in up to 90% of horses in a sample referred to an orthopaedic referral centre (Zimmerman et al., 2011). TL pain can be caused by impinging dorsal spinous processes (IDSPs). However, distinguishing between the cause of TL pain and IDSP diagnosis is variable. Contributing factors have been suggested which include the horse's age and breed. The study's objective was to identify and investigate the influence of breed on the presence and diagnosis of TL pain and/ or IDSPs.

Materials & methods: An online sample size of 360 respondents were recruited via an online survey in Microsoft Forms. The survey was distributed across the social media platform Facebook and consisted of thirty-three questions, with the number of questions asked dependent upon participant responses. A range of open, closed and Likert scale questions were used. Data from the survey responses were analysed and processed using Microsoft Excel and SPSS. Tests of Chi-Squared were run to determine the difference between individual breed groups. Statistical significance was set at <0.05.

Results: TL pain was reported in 62.3% (n=206) of the equine sample population, but only 67% (n=138) of horses with owner identified TL pain were diagnosed by a veterinary professional. Within this group, 73.2% (n=101) were diagnosed with IDSPs. See Table 1.

Table 1: Proportions of thoracolumbar (TL) pain, veterinary diagnosed TL pain and impinging dorsal spinous processes (IDSPs) in thoroughbred (TB), warmblood (WB) and Other breeds

Breed	Total in breed sample	TL pain reported	Veterinary diagnosed TL pain	ISDP diagnosis by veterinary professional
TB	69	55/69 (79.7%)	39/55 (70.9%)	32/39 (82.1%)
WB	123	63/123 (51.2%)	36/63 (57.1%)	29/36 (80.5%)
Other	150	88/ 150 (58.6%)	63/88 (71.6%)	40/63 (63.5%)
Total	342	206	138	101

Breeds other than TB or WBs formed a single group in this study. Descriptively, TBs had a greater incidence of owner reported TL pain compared to WBs and 'Other' breeds, however the 'Other' group contained a greater proportion of TL pain diagnosed by a veterinarian (Table 2). A greater incidence of IDSPs was seen in TBs and WBs in comparison to 'Other' breeds ($P \geq 0.0001$).

Discussion & conclusions:

The proportion of the sample with TL pain reported in this study (62.5%) is similar to previous reports of 65% (Zimmerman et al., 2011). Interestingly, owner reported incidence of TL pain was greatest in TBs but veterinary diagnosed back pain was greatest in the 'Other' group. This might suggest owners of non-TB and non-WB breeds are more likely to gain a veterinary diagnosis. Anecdotally, TB horses are most diagnosed with TL pain and IDSPs compared to other breeds (Zimmerman et al., 2011). This is supported by the findings of this study, with over 80% of TBs with TL pain having IDSPs.

The key finding of this study is the proportion of horses which have owner reported TL pain but are not diagnosed by a veterinarian. Thirty-three percent of owners had not gained a veterinary diagnosis for a horse they perceived as in pain. For horses with a veterinary diagnosis, 63.5%-82.1% were diagnosed with IDSPs. This suggests some horses with TL pain lacking a diagnosis may have IDSPs. A lack of veterinary diagnosis may limit access to any medical or surgical intervention, which may be required to resolve or manage the issue. This, alongside potential continuation of athletic and leisure activity, poses a significant equine welfare and ethical concern.

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The Use of Neuromuscular Electrical Stimulation by the Equine Physiotherapist in Practice.

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Key words: equine, electrical stimulation, physiotherapy, survey

Introduction: The use of neuromuscular electrical stimulation (NMES) to aid equine rehabilitation and training is growing, however most treatment protocols are extrapolated from human practice (Atalaia *et al.,* 2021). Knowledge of the use of NMES in equine practice may be useful to guide further research for the development of safer and more effective equine NMES protocols. Therefore, this study aimed to investigate the current use of NMES in equine practice.

Material & methods: An electronic questionnaire, targeting accredited equine physiotherapists, was used to ask NMES users about their use of NMES and non-NMES users about why they did not use NMES. Likert scale questions were used to indicate the frequency of NMES use compared to other modalities and in relation to different complementary modalities, perceived therapeutic effects, anatomical areas and medical scenarios. The frequency of occurrence of negative effects was also investigated. The Likert scale data was converted to an ordinal scale and transferred to SPSS, where Friedman and Wilcoxon sign rank tests were used to identify significant difference at $p<0.05$.

Results: The questionnaire received 61 responses, of which 42.6% (n=26) were NMES users, although most used NMES less than three times per week (73.1%; n=19). The respondents were registered with RAMP (47.5%; n=29), ACPAT (36.1%; n=22), NAVP (32.8%; n=20), IRVAP (23%; n=14) or no register (n=2), with 41% (n=25) with two registers. ACPAT members were significantly more likely to use NMES ($p<0.001$). Most of the remaining respondents did not use NMES because they perceived other modalities to have more beneficial effects (62.9%, n=21). The most common therapeutic modalities used both alternatively and complementary to NMES were manual therapies and dynamic mobilisation exercises, which were also used significantly more frequently than NMES in general practice (all $p<0.001$) according to figure 1. NMES was most used for the improvement of muscle function and recruitment, reversal of muscle atrophy, strengthening of muscles and reduction of muscle spasm, primarily applied to the back and pelvic limb, as shown in figures 2 and 3. The medical scenarios in which NMES was mostly used were performance, poor performance, neck or back injury and muscle strain, as shown in figure 4. Additionally, 19.2% (n=5) of participants stated that they used NMES in neurological cases. No negative effects were observed 'frequently'. Intolerance occurred more often than skin irritation.

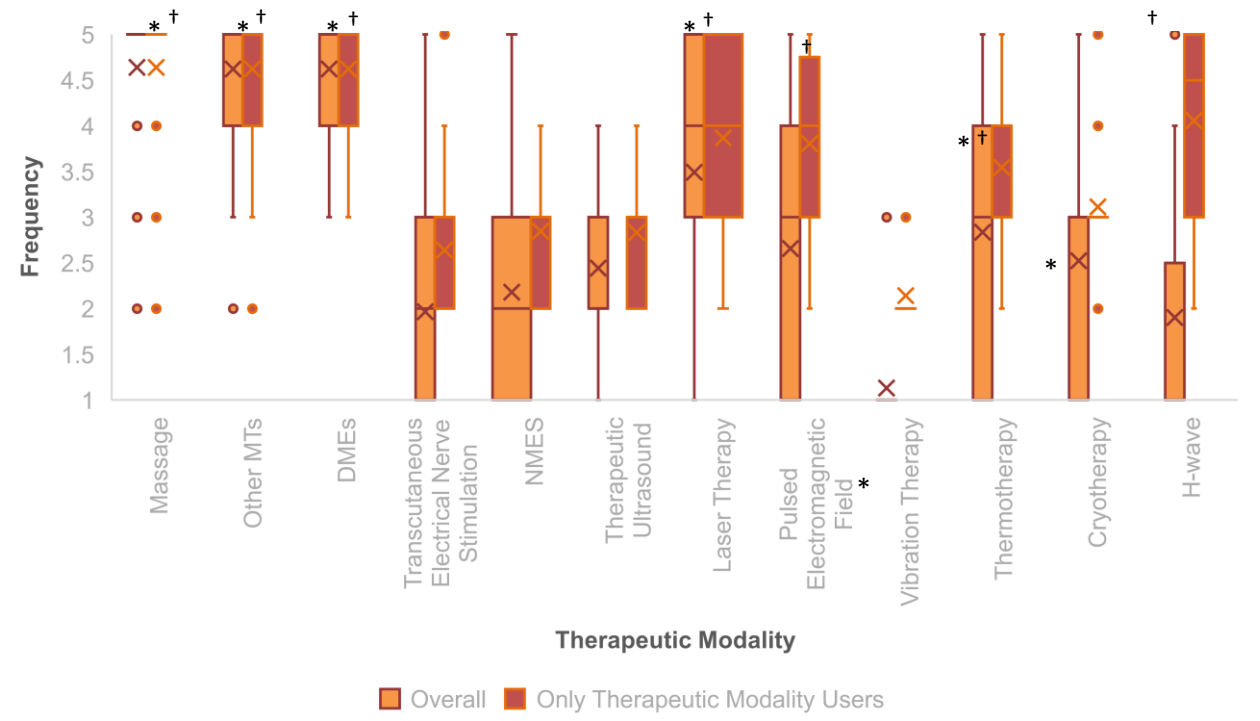

Figure 5: The frequency of use of therapeutic modalities overall and only by therapeutic modality users. Frequency key: 1 = never, 2 = rarely, 3 = sometimes, 4 = frequently, 5 = very frequently. * = significant differences between NMES and other modalities overall (P<0.05). † = significant differences between NMES and other modalities, only within modality users (P<0.05). MTs= manual therapies, DMEs= dynamic mobilisation exercises, NMES= neuromuscular electrical stimulation.

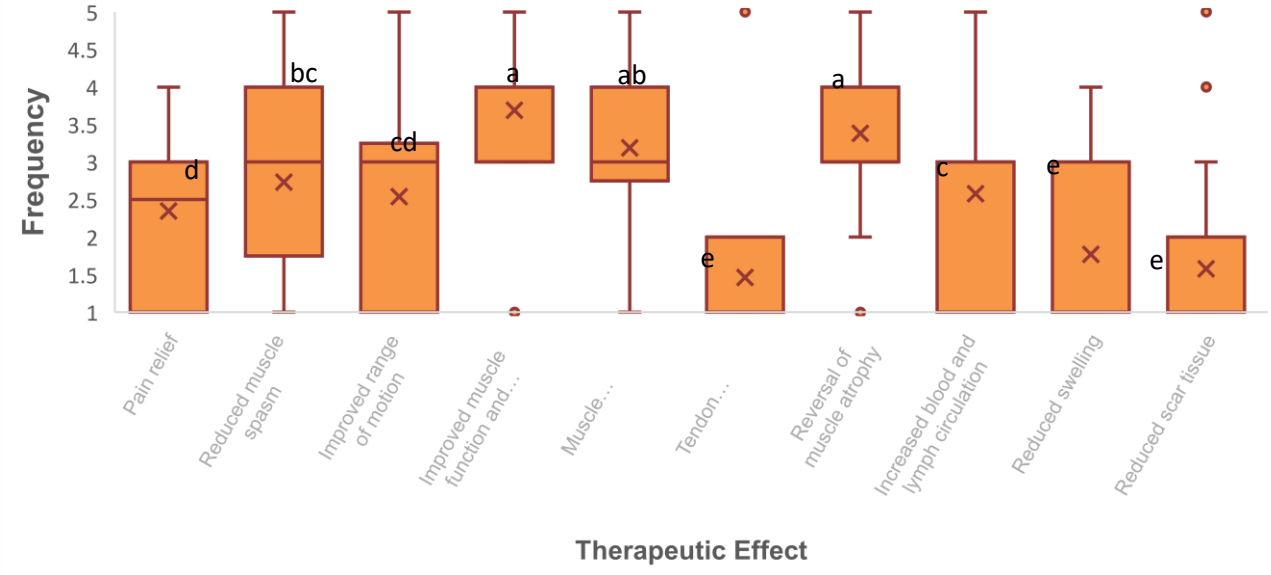

Figure 2: The frequency of NMES use for different therapeutic effects. Frequency key: 1 = never, 2 = rarely, 3 = sometimes, 4 = frequently, 5 = very frequently. a, b, c, d, e – different letters indicate significant differences between modalities (p<0.05). NMES= neuromuscular electrical stimulation.

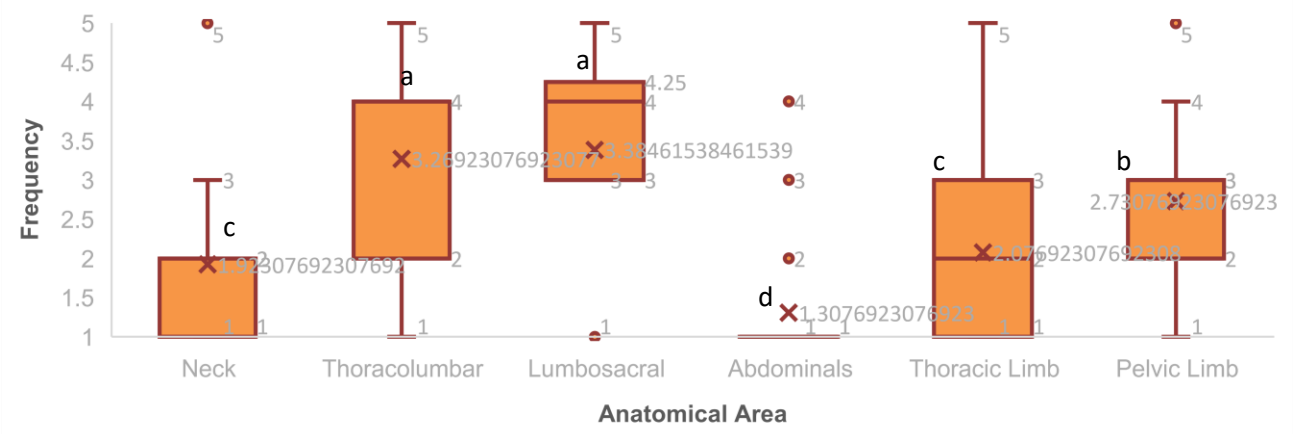

Figure 3: The frequency of NMES application to different anatomical areas. Frequency key: 1 = never, 2 = rarely, 3 = sometimes, 4 = frequently, 5 = very frequently. a, b, c, d – different letters indicate significant differences between modalities ($p<0.05$). NMES= neuromuscular electrical stimulation.

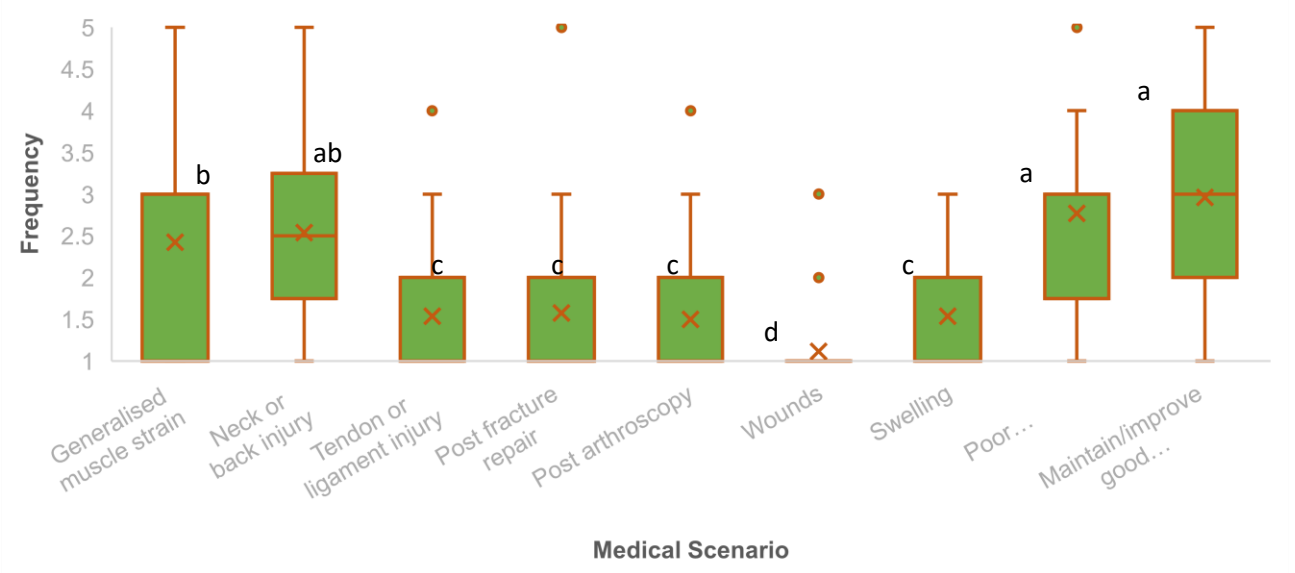

Figure 4: The frequency of NMES use in different medical scenarios. Frequency key: 1 = never, 2 = rarely, 3 = sometimes, 4 = frequently, 5 = very frequently. a. b, c, d – different letters indicate significant differences between modalities ($p<0.05$). NMES= neuromuscular electrical stimulation.

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A rider's return to the saddle following orthopaedic surgery

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Key words: Orthopaedics, Injury, Rider Psychology

Introduction: The psychological transition from injury to recovery is known to be complex and heavily individualised (Walker and Thatcher, 2012). Extremity fractures can remove a rider from the saddle for up to 6 weeks, however many riders are known to purposefully misinterpret medical advice for a prompt return, further increasing the likelihood of reinjury and chronic pain (Wiese-Bjornstal, 2014). The aim of this study was to investigate a rider's psychological progression from injury to getting back in the saddle.

Material & methods: Eight virtual, semi-structured interviews were conducted as part of this qualitative study. All participants were over the age of 18 and had been riding a minimum of three times per week. All participants had corrective surgery for an orthopaedic injury in the past 12 months and have since returned to the saddle. Thematic analysis was used to identify key themes experienced by participants (Kallio et al. 2016).

Results: Distinct differences in experiences were seen throughout, and categorised into initial experiences, recovery experiences, and return to riding experiences. The key experiences identified from this study were identified into nine second order themes respectively; guilt, denial, disorientation, depression, plan B, unmotivated, nervousness, loss of confidence, and liability.

Discussion & conclusion: This research has shown that returning to the saddle is a significant challenge to riders, as well as highlighting the scope for coaches and medical professionals to influence riders into seeking the appropriate psychological intervention. The understandings of this study could spark new initiatives to further support a riders well-being following a fracture, as well as to open new opportunities for involvement within the industry despite physical impairment.

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Equestrian coach and judge perceptions of the ideal body shape of female horse riders.

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Key words: Dressage, Bias, Physique, Matching

Introduction: Body image (BI) in females has been found to differ amongst sport types; those participating in aesthetically focused sports where leanness is prominent have been associated with more BI disturbances (Voelker et al., 2019). The ideal equestrian BI has been identified as a smaller physique and riders feel BI ideals influence judges scoring within dressage competitions (Forino et al., 2021). Previous research has also indicated that certain anthropometric values of female riders will influence rider ability (Randle & Loy, 2020). This research aimed to identify perceptions of equestrian coaches and dressage judges on rider body shape (BS) and detect if a bias is present; identify perceptions of the appropriate horse rider matching; and identify perceptions on the impact BS has on rider ability.

Material & methods: An online survey aimed at equestrian coaches and dressage judges (n=265) based in the United Kingdom, presented on 'GoogleForms™' was distributed for a four-week period on social media. Images for the survey were taken of twelve riders of different somatotypes riding three horses of different breeds. Open and closed-ended questions focused on perceptions of ideal BS on different horses, the ideal horse and rider combination, and the impact of BS on equestrian sport.

Results: Ectomorph was significantly perceived as the ideal somatotype on all three horses (X^2=44.084, P<0.001). No significant difference between coach and judge perception of BS from the BI scale image was found (X^2= 3.580, P=0.311) and both coaches and judges perceive that BS impacts rider ability (X^2= 13.960, P=0.001). Judge bias was determined through direct questioning and found no association between bias and ideal BS (X^2=3.46192, P=0.991), indicating that although judges state that body size or shape does not impact scores given, the ideal BS was still perceived as a smaller frame (X^2=83.2637, P<0.001). A significant perception for horse rider matching was found identifying the cob as being the most appropriate for the Endomorph physique, compared to the warmblood and thoroughbred horse (X^2= 691.932, P<0.001).

Discussion & conclusion: Judge and coach perceptions were consistent with previous research investigating female riders, indicating the need for future research into the effects of BS on rider posture and skill. Future research into physique related bias from judges is required to further identify the impact of BS on equestrian sport. Additionally, the importance of appropriate horse-rider matching became apparent, identifying the cob type horse as better suited to the Endomorph

physique. Thus, potentially reducing any occurring bias in equestrian sport, resulting in a more ascetically pleasing image, particularly relevant in dressage where subjective scoring of judges determines the success of the horse and rider combination.

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Analysis of a growing concern over the extinction of genetically inclined long-distance racehorses.

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Key words: thoroughbred, speed gene, flat racing, National Hunt

Introduction: The aim of the study was to analyse the contributory factors in the decline of genetically inclined long-distance Thoroughbreds (carrying the T allele) racing over 2000m particularly focussing on the influence of the C allele on the myostatin gene (known as the Speed Gene). Research by Bower *et al.* in 2012 reported the C allele was rare in the 18th and 19th centuries but is now proliferating due to popular sires carrying the speed gene. The possible reduction of the expression of the T allele has been reported as equivalent to the threat of climate change in the industry (Hill *et al.* 2019). Speed gene testing has been an important and valuable discovery for the industry and has started to change the way the industry views genetics, and training of racehorses (Hill *et al.* 2010, Thomson *et al.* 2014).

Material & methods: The main data collection method used for this research was a questionnaire, distributed via social media to those involved in racehorse breeding and research (n=170). The participants were all involved to some degree in breeding and were distributed across the United Kingdom. Questions included experience of the participants, knowledge of the speed gene and how they thought the issues would influence the industry. Data were analysed using MiniTab 19© and a series of Chi-squared 'goodness of fit' tests to determine differences in frequency of question responses.

Results: Significantly more respondents had knowledge of the speed gene than did not. (CH^2=4.57143, d.f.=1, p=0.033). However, no other significant differences were found including for usefulness of the speed gene and choice over testing for it . The question relating to the choice of using either the speed gene or pedigree was non-significant with an equal split between participants (CH^2=0, d.f.=1, p=1).

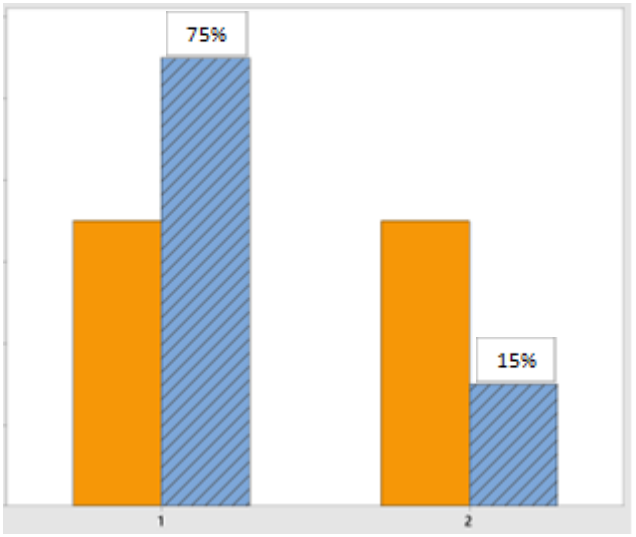

Figure 1: Chi-squared 'goodness-of-fit' Test for Association – knowledge of the speed gene

(Key: 1= has knowledge of the speed gene; 2= has no knowledge of the speed gene)

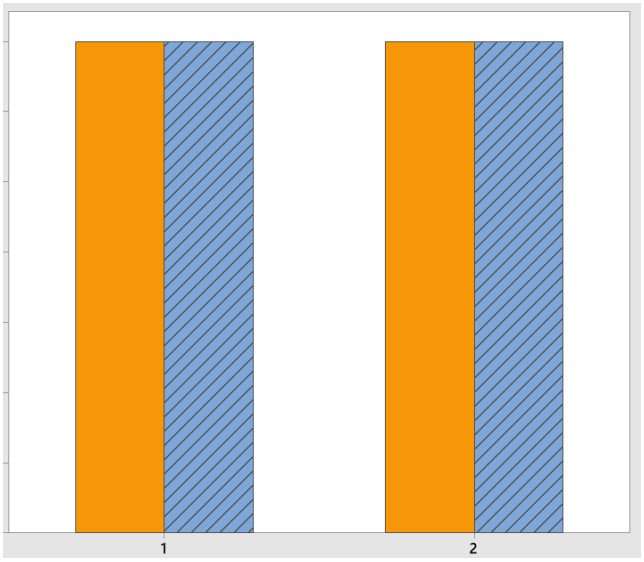

Figure 2: Chi-squared 'goodness-of-fit' Test for Association – would you consider the speed gene or pedigree for breeding choices

(Key: 1= would use the speed gene for breeding choices, 2= would use pedigree for breeding choices)

Discussion & conclusions: Most participants had been in the industry for over 20 years and were well established. Out of these a significant number of participants involved in racing knew of the speed gene, which is possibly unsurprising due to their length of time in the industry and the large body of research conducted in the T and C allele expression. Nevertheless, it was surprising to see an even split between those participants that would choose the speed gene over pedigree for

breeding purposes, and *vice versa*. This could indicate that participants are not necessarily selecting the speed gene in breeding as was hypothesised, and therefore the extinction of the T allele is not a concern. However, lack of genetic diversity has been reported due to the small number of desired sprinting stallions (Cassidy, 2002), and there is reported promotion of breeding horses with the speed gene (Thomson *et al.* 2014). If the future of the C allele and those horses that express it is to be secured, there is a possible need for discussion in the industry to promote long distance racing.

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