A preliminary investigation of bit type and rein tension effect on behavioural and locomotory parameters in the ridden horse.

Long, M*, V. Lewis & L.J. Cameron

*megan.long2@hartpury.ac.uk

Introduction

Tack and equipment fit influence work quality and comfort of the horse (Hockenhull and Creighton, 2013). Excessive points of pressure because of poor tack fit are reported to result in sub-optimal performance; however restrictive nosebands and poorly fitting saddles are common in equestrian sport. Reduced pressure under the saddle and bridle, notably under the noseband and headpiece, is evidenced to result in greater carpal flexion, tarsal flexion and limb protraction, subsequently improving potential equine performance (Murray *et al.*, 2015). Noseband pressure in particular, also appears to provoke behavioural responses of the horse, most notably conflict behaviours are evidenced with increased noseband pressures and tightness (Fenner *et al.*, 2016).

Anecdotally, rubber snaffle bits are deemed to be some of the mildest bits available for use in modern equestrian. On the other hand, a pelham bit with a curb chain is considered to have a stronger action than a snaffle and is deemed harsher due to the additional pressure points identified on the mouth and head of the horse when rein tension is applied. In the wrong hands, any bit can be damaging to the horse regardless of the perceived severity. Despite this, to the best of the author's knowledge there is an absence of research into the influence of rein tension and bit type on equine behaviour and kinematics.

Study aim

To investigate the influence of different bit types on rein tension and subsequent behaviour (conflict and positive behaviours) and stride length.

Methods

- Eleven horses of differing sex, age (12 ± 4 years), height (158 ± 11 cm) and discipline were included in the study. All horses were recruited from Hartpury University and College Student Livery.
- Horses were equipped with the iPos Rein sensor system (IPOS Technology B.V., 5656 AE Eindhoven, The Netherlands) on both reins and anatomical markers on bony landmarks on both sides of the horse. Horses were ridden in both a snaffle and non-snaffle bit. An AB or BA design was utilised, with grouping randomly assigned to facilitate a randomised cross-over study design.
- Data collection took place in a 25 x 35 m indoor arena with Andrews Bowen Pro Wax Surface. A 20m runway on the long side of the arena was used for the trial runs.
- As per Murray et al. (2015), three straight line repeats in working trot rising on the runway on each rein occurred in both bits. A total of twelve passes was recorded by an iPhone mounted onto a PIVO R1 Pod with the PIVO + iPhone app to facilitate automated tracking for recording each horse's trials.

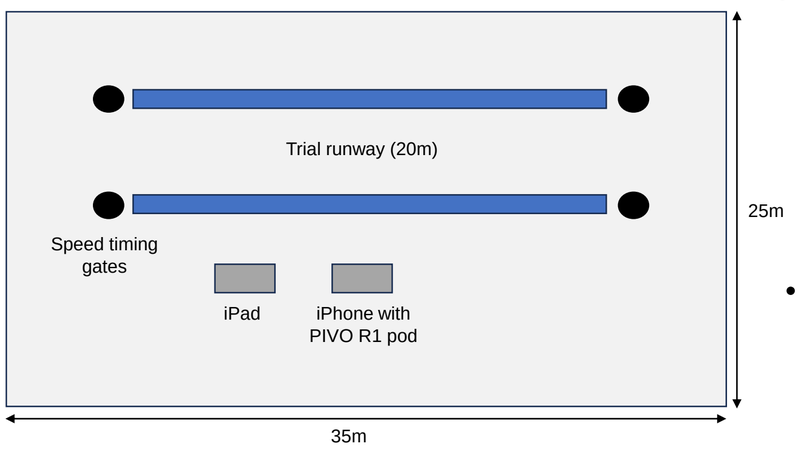

Figure 1: Illustration of the study set-up.

- Rein tension was continuously recorded throughout each trial for each bit and kinematic data were recorded using an iPad (9.7, 2017, 5th gen). The video data were recorded, downloaded to an Apple MacBook Pro, and processed using two-dimensional motion capture software (Kinovea, 0.9.5) to measure stride length.
- Continuous focal sampling was used to observe the occurrence of the behaviours and counts of each behaviour. An adapted version of Dyson's Ridden Pain Ethogram was utilised, and a novel positive behaviour ethogram was made for this study.

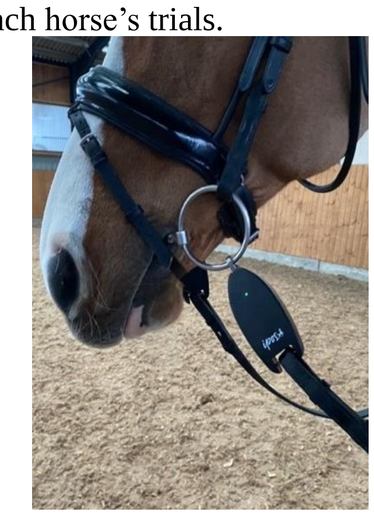

Figure 2: iPos Rein Sensors attached to the reins.

Figure 3: PIVO R1 Pod mounted on a tripod was used to record the trials.

Results

- A significant difference between median rein tension and bit type was seen between snaffle and non-snaffle bits ($Z = -6.567$, $p<0.001$). Rein tension was greater in snaffle bits than non- snaffle bits (Figure 4)
- Descriptive observations showed a greater median frequency of conflict behaviour when the horse was ridden in the snaffle bit. A 40.5% increase in conflict behaviour observations was shown in horses ridden in snaffle bits compared to when ridden in non-snaffle bits.
- No significant difference was observed between the frequency of positive behaviours expressed when the horse was ridden in either bit type.
- There was a significant difference in rein tension and stride length when ridden in a snaffle bit ($Z = -0.850$, $p = 0.004$). There was a longer mean stride length when horse were ridden in a snaffle bit (416.72 ± 51.21 cm) versus a non-snaffle bit (408 ± 43.90 cm).
- A higher rein tension was associated with a shorter stride length. No statistical significance or correlation was shown when the horse was ridden in a non-snaffle bit.
- A moving median filter was applied to the rein tension data to mitigate the influence of extreme, anomalous values.

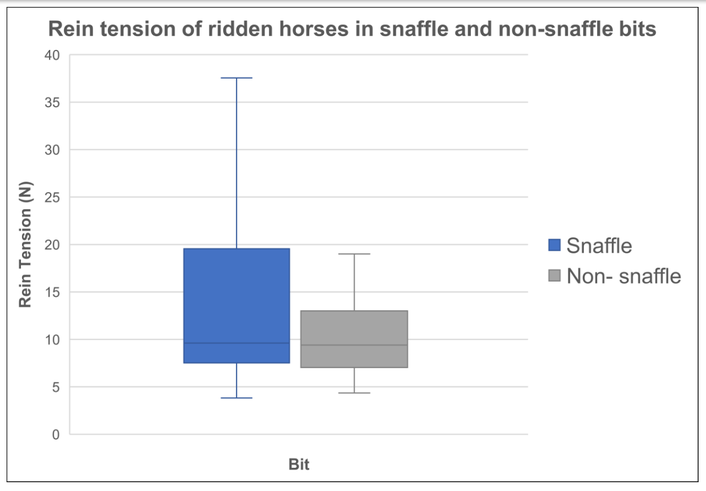

Figure 4: Box plot to shown rein tension (N) in snaffle and non- snaffle bits

Discussions & Conclusion

- This study highlights a relationship between bit type, rein tension and the potential impact bit type has upon behaviour, notably conflict behaviour in the ridden horse. Understanding the relationship between these factors can support advances in modern equitation to facilitate optimal bit choice for the horse.
- In this study, higher rein tensions were seen in snaffle bits, perhaps surprising considering an anecdotal understanding of non-snaffle bits being 'harsh' and 'strong'. A snaffle bit is supposedly softer, and understandably a greater level of force is required down the reins to a snaffle bit to give the same feeling as the non-snaffle bit. There is a lack of cohesion between supporting scientific evidence and industry practice of bit choice, despite the fundamental importance a contact down the reins has in horse-rider communication.
- With optimal equine welfare in mind, signs of conflict behaviors in any bit should be of concern. Understanding the ideal bit for each horse may contribute to a reduction of such behaviour and further research into not only the bit type, but bit mouthpiece and ring choice should be analysed.
- Increasing rein tension is observed to decrease stride length (Eisersiö et al., 2015) and is also observed in this study. A degree of rein tension will always be present between the rider and the bit because of the contact established in the working ridden horse (O'Neill., 2018). Biomechanically, the horse's stride length will decrease with an increased contact and rein tension

As science gathers data to inform equitation practices, it will become more evidence based, and less a matter of anecdotes. Despite current industry attempts to support ridden horse welfare, perhaps the advent of ethical equitation is yet to come.

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