A pilot investigation into the limb phasing characteristics and stride length of fully shod, partially shod and barefoot horses

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Introduction

One of the biggest debates of the equine industry revolves around the famous saying “no foot, no horse”; should the horse be shod, or not. Since the invention of the horse shoe and until very recently, it was standard practice to shoe horses once they had been backed and were beginning their ridden career (Cook, 2003).

Advocates of the barefoot movement however claim that keeping a horse unshod is beneficial to the horse’s physical wellbeing (Jackson, 2012). Indeed, inexplicable and recurrent lameness is still often associated with shoes, and is drawing some owners away from shoeing (Teskey, 2005). Shoeing is used to protect working horses’ hooves from excessive wear, balance seemingly unbalanced hooves, and straighten the limbs of uneven horses (Barker and Braithwaite, 2009). Despite the advantages shoes seemingly bring it is believed they may impair correct hoof function (Jackson, 2012).

Anecdotal evidence of horses returning to being sound once they are unshod abounds, but how much of an impact shoes actually have on the movement of horses is unclear. By comparing the stride duration and limb phasing characteristics of shod, partially shod and unshod horses, the aim of this study was to quantify differences in stride characteristics of the horses and identify any real differences in their gait.

Hypothesis: There will be a significant difference in the stride duration and limb phasing characteristics of fully shod, partially shod and barefoot horses.

Null hypothesis: There will not be a significant difference in the stride duration and limb phasing characteristics of fully shod, partially shod and barefoot horses.

Materials and Method

Twelve unshod privately owned horses, six shod and six partially shod riding school horses were recruited from a convenience sample. The ETB Pegasus limb phasing system was used to determine limb temporal characteristics. The horses were fitted with the limb sensors via special-purpose brushing boots, and were then walked and trotted in hand for a set distance to collect data on their stride characteristics.

The Poseidon software was used to recover the data collected by the sensors. The data from the PDF files produced was later compiled in tables in order to be analysed. A one-way ANOVA analysis was calculated for each variable, producing statistical results. Means of the variables were also calculated, producing a vast amount of numerical data which was later analysed in depth.

Results

Analysis of the results was done through a one-way ANOVA test. The results suggested that there was no significant difference in the individual stride duration at walk (p=0.291) or trot (p=0.430) between horses that were shod (mean=1.14 s, +/-0.29 and 0.67 s, +/-0.17, respectively), partially shod (mean=1.17 s, +/-0.27 and 0.68+/-0.16, respectively) and unshod (mean= 1.21 s, +/-0.05 and 0.71+/-0.02, respectively). As shown in Fig. 1.

Equally, data collected on the limb phasing characteristics (sagittal and coronal cannon range and time in stride for maximum protraction and retraction of the forelimb and hind limb) showed no noticeable differences between the different shoeing regimes. However, forelimb and hind limb analysis for overall symmetry values in the sagittal and coronal ranges at walk and trot returned results of p=0.34 (walk) and p=0.04 (trot) (Fig. 1). This may support the theory that farriery used as a tool to correct unbalanced limb conformation may be effective and that weight added to the distal forelimb appears to increase its range of motion.

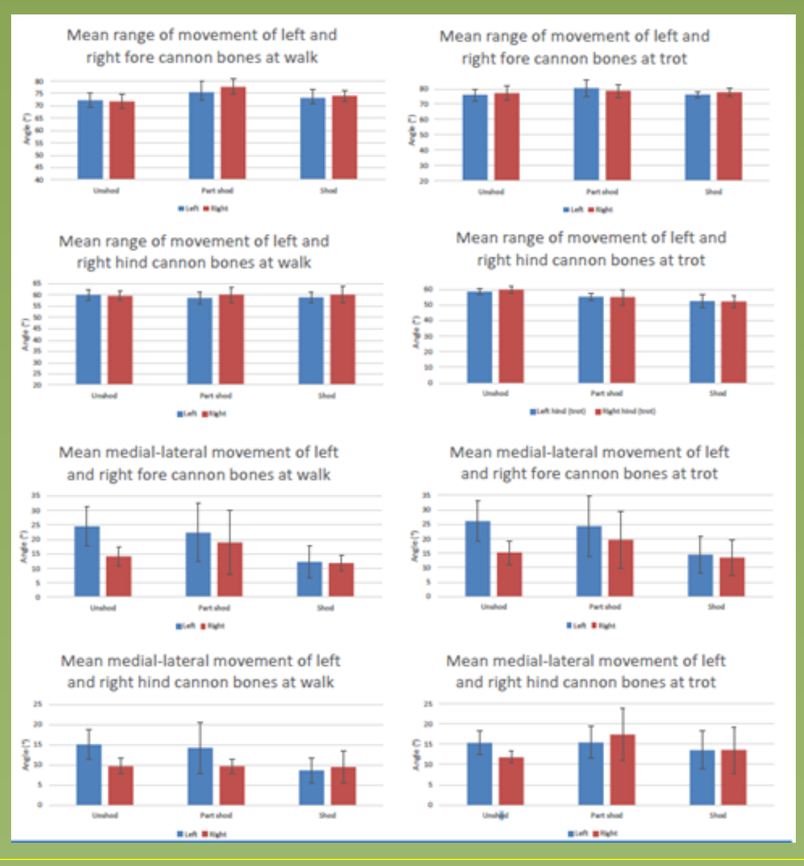

Fig. 1 : Differences in stride duration and range of movement

Discussion

The variation in speed of the horses may have affected the stride duration (Clayton, 1994; Clayton, 1995; Morales et al., 1998; Khumsap et al., 2002). The use of a treadmill could have normalised the speed at which horses were going (Willemen et al., 1997) but may have affected the rest of the data (Morales et al., 1998). The effect of shoeing only the forelimbs seems to resemble, to a lesser extent, the effect over loading the forelimb has in breeds such as the Tennessee Walking Horses; increasing the range of motion of the forelimb and reducing the range of motion of the hind limb. Wickler et al. (2004) stated that added weight to the limbs increases range of motion of the hind limb but this does not seem to be the case for the shod horses of this study.

Farriers use trimming and shoeing in order to correct hoof abnormalities arising from less than ideal limb conformation and to improve gait (Barker and Braithwaite, 2009). This is reflected in the results of this study, which show that shod horses exhibit the least amount of medial-lateral movement in their forelimbs and hind limbs at walk and trot. Shoeing the limb for straightness is not always ideal however and although it produces a straight moving horse, it may result in injury. The unshod horses all have increased proprioception (Teskey,2005), which means they are more aware of the surface they are evolving on. This may also explain why the limb phasing characteristics of the unshod horses were not as linear as it was expected they would be, if the unshod horses were feeling the stones under their feet, rendering their stride pattern uneven.

In the three groups of horses, there was more medial-lateral movement than the norm (Hodgings, 2014) which may have been a result of poor handling during the trial (Moore, 2010). Hoof shape has an effect on stride characteristics (Page and Hagen, 2002; Mansmann et al, 2010; Weishaupt et al, 2013), and so does the weight (Huguet and Duberstein, 2012) and placement (Duberstein et al., 2013) of the shoe. Normalising the hoof angle and using horses which are all shod with the same type of shoe (weight, shape and placement) may have controlled some variables. This study found no significant differences in the limb phasing characteristics of horses that are shod, partially shod or unshod. Future research could study the effect shoeing has on the limb phasing characteristics of previously sound, hard-working barefoot horses. It could also investigate the changes in limb phasing characteristics before, during and after transitioning shod horses to being barefoot, or vice versa.

Conclusion

The shoeing decisions of a horse owner may have implications for the identification of early signs of lameness and training effectiveness. This study did not show statistically significant differences between shoeing regimes, however, advice should be sought from a qualified applied equine podiatrist or farrier with an understanding of the movement idiosyncrasies surrounding each individual horse. Further research is needed.

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