A preliminary investigation of hoof circumferential changes of riding school horses with an increase in workload

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INTRODUCTION: Directly involved in the absorption of forces during loading, the smart structure of the equine hoof has adapted to withstand the demands of evolution and domestication. Loading during locomotion places extensive strains through the dynamic structure of the hoof (Pollitt, 2004) causing it to respond by changing its conformation to adjust to the loading forces (Kroekenstoel, et al. 2006). A decrease in the circumference of the coronet band in racehorses has been documented as workload increased; reverting during a decrease in workload (Decurnex, Anderson and Davies 2009). The aim of this study was to determine potential changes in circumferential hoof parameters within a population of non-racing horses with an increase in workload.

METHOD: Using an observational, cohort study design, hoof base circumference (HBC) and coronet band circumference (CBC) measures were collected via tape measure from 32 shod (shod all, n=17; shod front only, n=12) and unshod (n=3) riding school horses (Fig. 1). Measurements were collected at three 5-week intervals (DC1-3) between the months of September and December. Shod forefeet were sub-grouped into those with toe-clips (n=16) and with side-clips (n=9). Workload intensity increased from low in September to medium-high by December. Wilcoxon's matched-pairs determined circumferential differences between left-right hooves for each DC ($p<0.05$); Kruskal-wallis analyses with post-hoc and Bonferroni adjustment ($P\leq0.02$) examined differences between DC.

Figure 1: Tape measure positioning (Decurnex *et al.*, 2009)

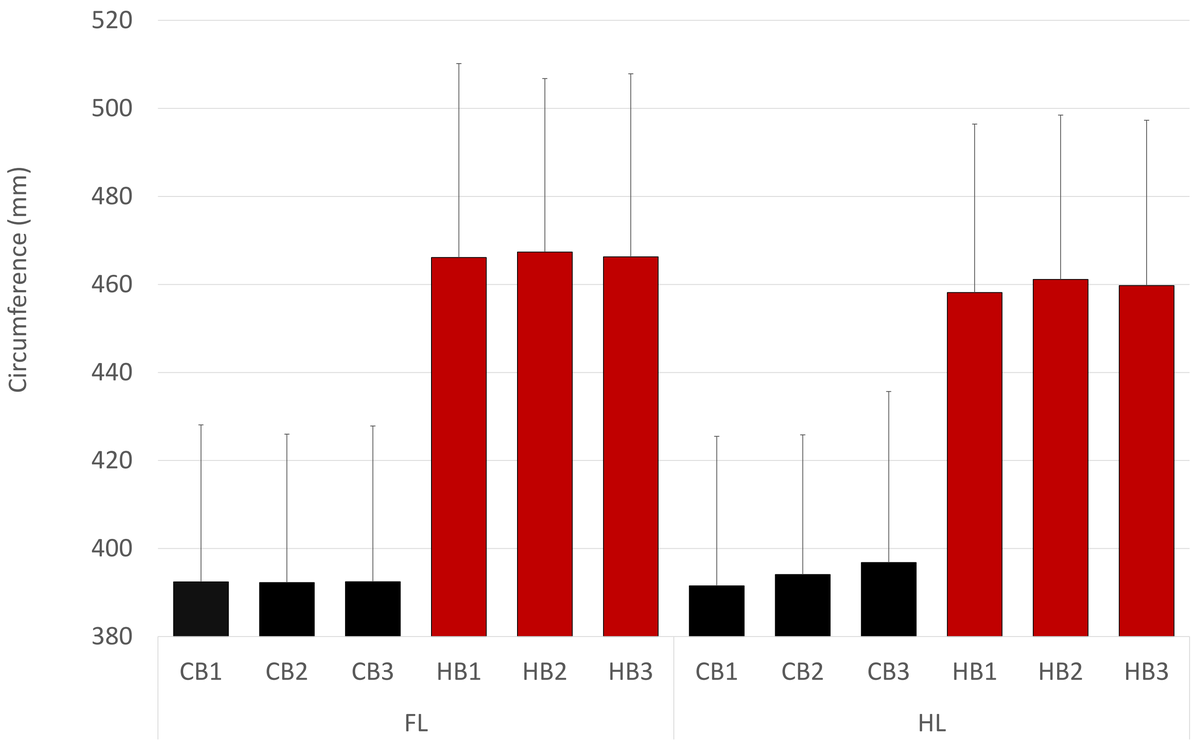

Figure 2: CB and HB measurements changes across all three data points

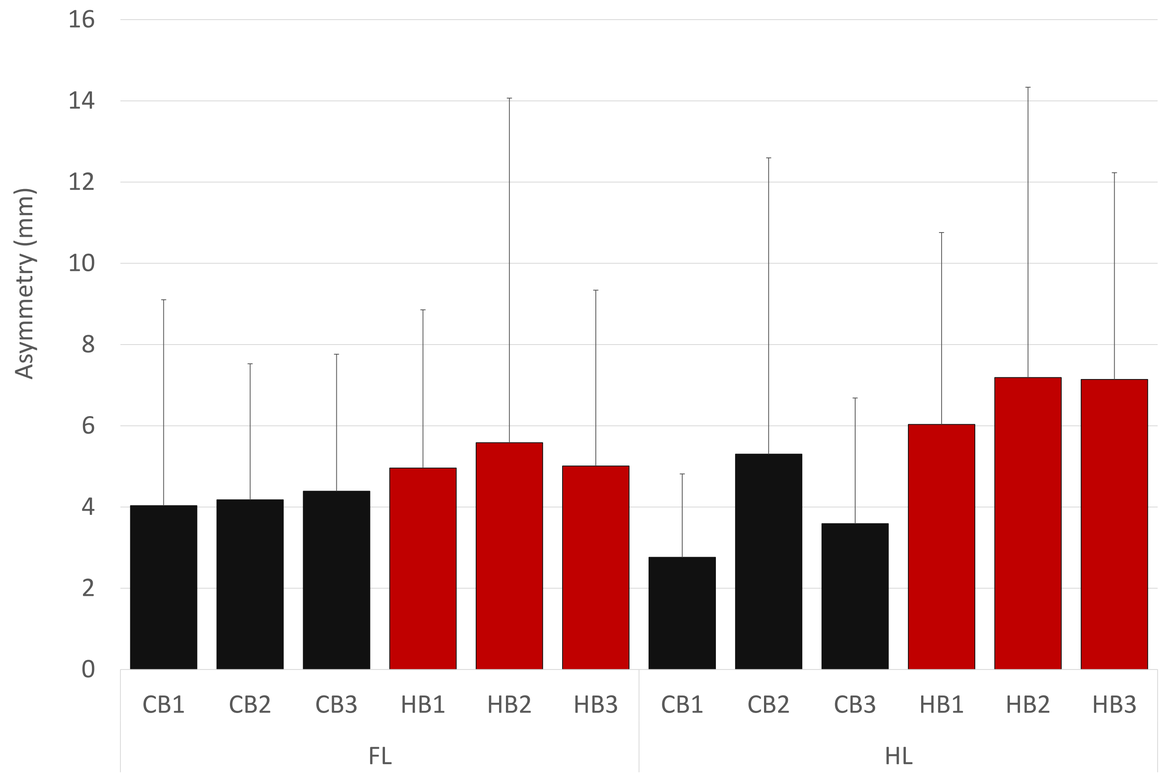

Figure 3: CB and HB asymmetry changes across all three data points

RESULTS: Forelimb CBC's were significantly larger for the right than the left foot at DC3 ($p\leq0.05$). Right side HBC and CBC of the hindlimb were larger at all data collection points (DC1 $p\leq0.05$; DC2 $p\leq0.05$; DC3 $p\leq0.001$). Hindlimb CBC was significantly ($p\leq0.02$) larger at DC2 (392.1mm) than DC1 (389.8mm) (Fig. 2).

CBC and HBC differed between all forelimb subgroups. Circumferential asymmetry only differed at DC1 where CBC asymmetry was significantly lower ($p\leq0.02$) for horses with toe-clips compared to side-clips (Fig 3.). Mean hind CBC in shod feet increased significantly ($p\leq0.02$) between DC1-DC2.

Routine management resulted in some horses having their hind shoes removed between DC2-DC3; these individuals demonstrated an increase in right CBC at DC3 reflected by a significant increase ($p\leq0.02$) in mean CBC between DC1-DC3.

CONCLUSIONS: Riding school horses demonstrated significant changes in hoof conformation, related to increased CBC, in contrast to findings reported in racehorses; the difference in results is likely due to discipline related exogenous stressors. Limb concussion experienced by riding school horses would be of a lesser magnitude, but longer duration, than those of racehorses.

The landing position of the foot in gallop result in racehorses predominantly loading the heel bulbs, concentrating the loading forces, potentially leading to retardation of hoof growth. Loading across the foot, and consequentially the coronet band, varies more in riding school horses due to the variety of gaits and orientations. Such loading variations may potentially have a stimulatory rather than retardation effect. The significant differences between values for shod and unshod hooves indicate variation in foot conformation associated not only with the use of shoes, but also with the type of clip used when considering the front feet. This warrants further investigation to determine potential implications for hoof health, soundness and biomechanics.

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