

Induced rider asymmetry and its effects on equine limb kinematics and thoracolumbar range of motion

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Reasons for performing study

Equestrian sport requires the coupling of two athletes which is complex and requires coordination, with the ultimate goal of providing synchronised movement between the horse and rider dyad. Studies have shown; the influence that the rider and rider experience¹ can have on horse locomotion and the discrepancy between rider perception and objective measures². Biologically, both horse and rider are likely to have a level of asymmetry however, there is a paucity of evidence on the effect that rider asymmetry has on whole horse locomotion.

Objectives

- ✓ To evaluate the effect that rider asymmetry has on horse whole locomotion and limb loading.

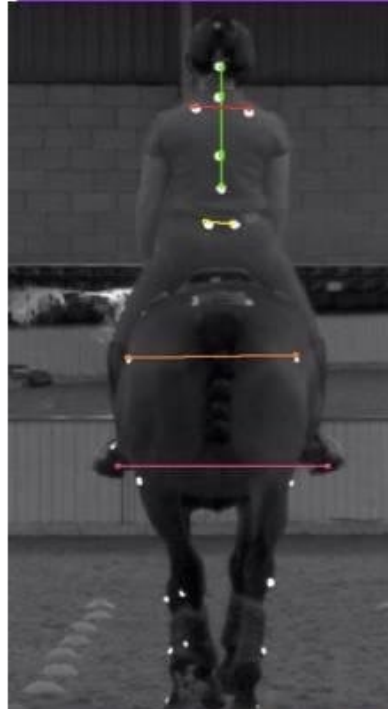
Materials and Methods

- ✓ 10 rider-sound horses (mean±SD age 11±3 years, mean±SD height 1.50±0.67m)
- ✓ Riders static weight for their left and right limb was measured using two scales.
- ✓ Horses were equipped with twenty four joint centre markers allowing for 2D motion capture (Quintic).
- ✓ Horses were equipped with 8 (X-Sens) inertial sensors (poll, wither, eighteenth thoracic vertebra (T18), third lumbar vertebra (L3), sacrum, left and right tuber coxae).
- ✓ Riders were equipped with motion capture markers allowing for rider kinematics to be quantified
- ✓ Data was collected in rising trot on both the left and right rein with symmetrical stirrups and then rider asymmetry were induced by means of shortening one stirrup by 5 cm.
- ✓ Differences in range of movement (ROM) were assessed with a paired T-test (P<0.05).

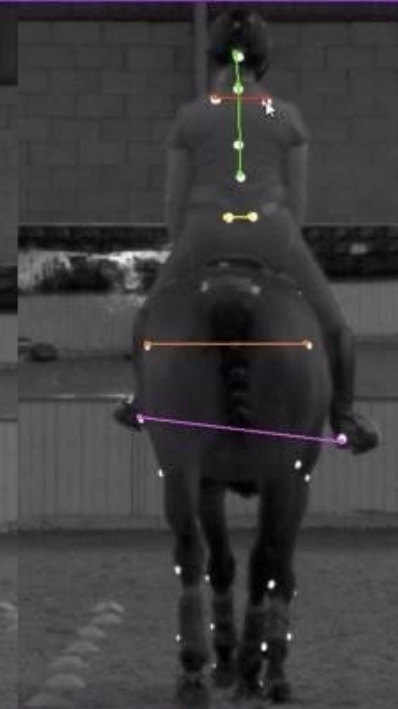
References

1. Peham C, Licka T, Schobesberger H, Meschan E. Influence of the rider on the variability of the equine gait. *Hum Mov Sci.* 2004;23(5):663-71.
2. Guire R, Mathie H, Fisher M, Fisher D. Riders' perception of symmetrical pressure on their ischial tuberosities and rein contact tension whilst sitting on a static object. *Comparative Exercise Physiology.* 2017;13(1):7-12

Symmetrical Stirrups



Asymmetrical Stirrups (Left Stirrup Shortened)



1, horse fitted with IMU's and motion capture markers; 2, one stirrup shortened by 5 cm; 3, rider fitted with motion capture markers

Results

With a shortened left stirrup the following parameters showed a significant increase:

IMU derived parameters:

Latero-lateral range of motion

- ✓ Withers (P=0.02)
- ✓ Third lumbar vertebra (L3), (P=0.02)
- ✓ Left tuber coxae (P=0.04)

Craniocaudal range of motion

- ✓ Left tuber coxae (P=0.04)

2D Motion Capture derived parameters:

- ✓ Right front fetlock hyperextension (P=0.01)
- ✓ Left carpal flexion (P=0.04)
- ✓ Right hind fetlock hyperextension (P=0.04)

Data normalised to represent n=10 left stirrup shortened

Conclusion

Asymmetric rider position has an effect on thoracolumbar range of motion and limb kinematics. These findings warrant further investigation to understand the long term impact this has on gait symmetry.