

Asymmetry and leg length inequality in riders while static and in sitting trot

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Introduction

Symmetrical posture while horse riding is necessary for effective communication. The horse relies on physical signals from the rider (Kang et al 2010), therefore postural or weight asymmetries could confuse the horse; negatively affecting its balance and potentially hindering competitive performance (Symes and Ellis 2009, Pugh and Bolin 2004). Asymmetry of the rider's shoulders has previously been correlated with leg length inequality (LLI) (Symmes and Ellis 2009); an asymmetry present in 90% of the general population (Knutson 2005). This study aims to further the work by Symmes and Ellis (2009) and Lovett et al (2003), by identifying postural asymmetries between the left and right sides of the rider while stationary and in sitting in trot, and identify any correlation with leg length inequality.

Method

Left and right perpendicular cameras were used to record a mixed discipline group of riders (mean age 20 ± 1 yr, mean height 170 ± 5.5 cm and mean weight 68 ± 9.4 kg) on a mechanical horse while static, and in the highest and lowest positional points of the sitting trot. Dartfish computer software was used to identify the absolute angles of the upper arm (A1), the trunk (A2), the thigh (A3) and the lower leg (A4), and the relative angles of the shoulder (A5), the elbow (A6), the hip (A7) and the knee (A8) on both sides of the rider. The asymmetry in angles between the left and right sides was then compared. Leg length was measured from the anterior superior iliac spine across the front of the leg to the medial malleolus.

Results

While the riders were static A1 was very highly significantly larger on the right side ($P = 0.000$) however no other angle showed significant differences between the left and right sides. Despite the lack of further statistical significance, data trends indicate the rider to be twisted to the left and carrying the right hand lower than the left. In the highest point of the trot all angles were larger on the right side; those with statistical significance were A1 ($P < 0.001$), A3 ($P < 0.05$), A7 ($P < 0.05$) and A8 ($P < 0.01$). In comparison to the left twist position of the rider while static, the rider changes orientation and twists to the right in the lowest phase of the trot; A4 ($P < 0.05$) and A8 ($P < 0.05$) being significantly larger on the left.

A significant positive correlation was identified between LLI and the asymmetry value of A7 (Figure 1). This correlation supports the data trends within this study and indicated that the rider twists in a figure of eight movement to absorb the motion of the trot; during this motion, the longer left leg is more weight bearing causing the left rotation of the shoulders.

Conclusion

Rider asymmetry and LLI has been identified in the rider; confirming the anecdotal notion of the crooked rider and highlighting the possible causal pathway and relationship between asymmetry and LLI. The longer left leg, present in 90% of the general population, is theorised to cause uneven weight distribution and unequal forces generated through the limbs create pelvic asymmetry. This pelvic rotation and force imbalance is then more readily deferred to, and more overtly displayed as anti-clockwise, or left rotation of the shoulders, as identified in this study.

References

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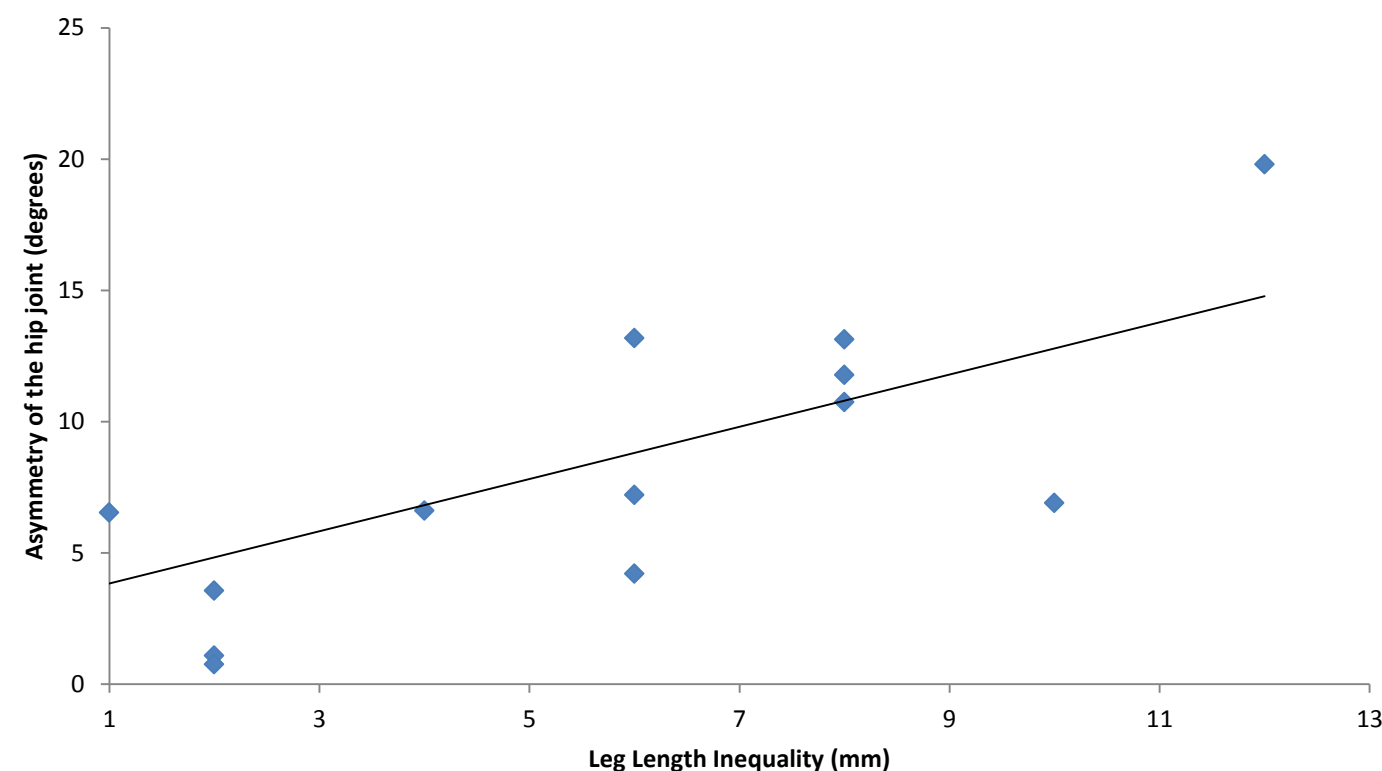


Figure 1: Significant correlation between LLI and asymmetry of the hip joints