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Static and Dynamic Postural Asymmetry of the Rider

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Introduction

Postural asymmetry is commonly seen in horse riders and can be associated with poor performance, however, the prevalence and manifestation of asymmetry has received minimal attention within literature and has yet to be quantified sufficiently. Kinetic research demonstrates that asymmetric positioning of the rider can significantly alter the forces acting on the horses back (Cocq et al 2009); however the affect on the horses kinematics has yet to be quantified. Consequently establishing both the manifestation and cause of rider asymmetry could act as a forerunner to understanding the influence on the horses kinematics and aid in improving rider performance. Preliminary results by Symes and Ellis (2009) quantified asymmetry of the riders (n=17) within their study and evaluated leg length discrepancies as a possible predisposing factor. However the affect of the horses motion on the asymmetry observed was not established and a number of variables within their study were not controlled. The aims of this study were therefore to evaluate asymmetry of the rider within a static position and during sitting trot and to establish any correlations with leg length discrepancies.

Figure 1: Marker position

Method

Fifteen female riders, aged 18 to 22 years (21.5±0.71, mean body mass 67kg± 9.42kg, mean height 169.9cm± 5.5cm) all with a competitive record within a range of disciplines, and riding at least five times a week took part in the study. Although not a variable for this study, the handedness of the riders were recorded; all subjects were right hand dominant. Video analysis was used to measure eight joint angles of the upper limbs, lower limbs and trunk of the rider during the highest and lowest point of the simulated stride cycle and also within the static position to quantify the effect of motion on the degree of asymmetry observed. Reflective markers were placed on the approximate instantaneous centre of rotation of the joint (Figure 1), to enable accurate calculation of the joint angles. Two cameras situated perpendicularly to the axis of the mechanical horse were used to capture both the static and dynamic data and leg length discrepancies (LLD) were also measured to identify correlations between LLD and angle discrepancies. Dartfish connect 5.5 was used to analyse the films and statistical analysis was carried out using SPSS Version 18.0. Related samples T-tests were used to established bilateral differences in joint angles and for differences between the angles in each of the three frames. A Spearman rank correlation coefficient was used to determine if a correlation existed between LLD and the calculated difference of the left and right angles.

Results

Related samples T-tests performed for bilateral discrepancies identified very highly significant differences ($p \leq 0.001$) in the absolute angle of the upper arm, for all of the frames measured. Upper arm angles (angle 1) expressed larger tendencies on the right (as shown by figure 2) through a more vertical upper arm position and retraction of the hand. During motion the lower leg absolute angle was significantly different ($p \leq 0.05$) with larger left leg angles (angle 4) indicating a straighter limb. Significant differences were also seen between the two points of motion for the absolute angles on the right side for the trunk ($p \leq 0.001$) and thigh ($p \leq 0.05$), whereby angles increased during the highest point in the cycle. These results indicated rotational movement of the rider, within which the rider's right shoulder and hip were posteriorly rotated in relation to the left. No significant correlations were observed between the asymmetry of joint angles and LLD ($P \geq 0.05$), however conclusions suggest that lateral dominance of the rider may be an influencing factor.

Table 1: Angle asymmetry P values

Angle	Frame 1 (down)			Frame 2 (up)			Frame 3 (static)		
	P value	Angle greater		P value	Angle greater		P value	Angle greater	
		L	R		L	R		L	R
1	0.000	0	14	0.005	2	12	0.000	1	13
2	0.218	8	6	0.007	3	11	0.716	6	8
3	0.808	5	9	0.098	2	12	0.180	4	10
4	0.012	11	3	0.015	10	4	0.077	7	7
5	0.234	11	3	0.022	12	2	0.069	5	9
6	0.920	7	7	0.856	6	8	0.117	11	3
7	0.816	7	7	0.684	6	8	0.141	5	9
8	0.136	8	6	0.515	7	7	0.603	6	8

Conclusion

The present study suggests some commonly asymmetrical postures may be adopted by riders; the degree and type of asymmetry observed appears to be exaggerated during motion of the horse. Typically, alterations in posture occur within the upper limbs of the rider through a greater retraction of the dominant limb. However, as despite the theoretical basis, leg length discrepancies did not show any significant correlation with the postural asymmetry observed, therefore the underlying cause of the rider asymmetry requires further research. Potentially, as suggested by the results of this study lateral dominance should be considered as a potential predisposing factor.

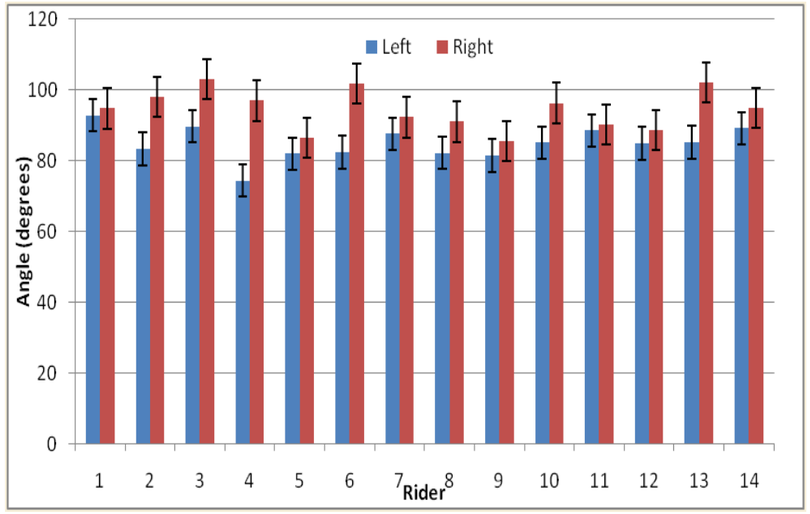

Figure 2: The mean left and right values for angle 1 in frame 1 (p = 0.000).

References

Cocq, P., Clayton, H.M., Terada, K., Muller, M. and Leeuwen, J.L. (2009). Usability of normal force distribution measurements to evaluate asymmetrical loading of the back of the horse and different rider positions on a standing horse. *The Veterinary Journal.* 181, 266-273.

Symes, D. and Ellis, R. (2009). A preliminary study into rider asymmetry within equitation. *The Veterinary Journal.* 181, 34-37.

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