Forehand drop in walking dressage horses on treadmill

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Kinematic asymmetries are used extensively in lameness detection at trot but have received little attention at walk. The objective was to seek asymmetries in vertical excursions of the withers during walking in horses that were sound at trot. Seven high-level dressage horses clinically sound during trotting were evaluated as they walked unmounted and unrestrained on a force-measuring treadmill. Twelve infrared optical cameras tracked reflective markers placed on standard anatomical landmarks. Mixed models were used to study associations between contralateral mean-trial differences (5-8 trials per horse) in minimal height of the spine at the sixth thoracic vertebra at early left vs right forelimb stance (T6minDiff) and spatiotemporal and vertical ground reaction force (vGRF, 1st and 2nd peak) variables. One horse was quite symmetrical, 5/7 horses consistently had T6 lower in early left fore stance, and one horse had T6 lower in early right fore stance. Trial-mean asymmetries ranged between 0.3 and 23 mm. When T6 was relatively lowest, the retracted forelimb showed increased retraction distance (+1 mm predicted +0.17 mm T6minDiff) and decreased stance duration (+1 ms predicted -0.3 mm T6minDiff) compared with the contralateral forelimb. The haunches were displaced toward the retracted forelimb, and the hindlimb ipsilateral to the retracted forelimb showed greater protraction and retraction distance (both +1 mm predicted +0.2 mm T6minDiff) than the contralateral hindlimb. There were no differences in peak vGRFs, suggesting that the kinematic asymmetries reflect sidedness rather than lameness. Further studies of locomotor asymmetries at the walk are needed both in sound and lame horses.

Withers movement symmetry can differentiate forelimb lameness from compensatory lameness in horses

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The objective of this study was to investigate whether the previously described compensatory asymmetry patterns in horses with induced lameness were evident also in horses with naturally occurring lameness. Three hundred and ninety horses, presenting for lameness at two European university equine clinics, were equipped with reflective markers at pre-determined anatomical landmarks. The data were collected using an optical motion capture system (Qualisys AB, Sweden) with the horse trotting in a straight line on a hard surface. The difference between the two vertical displacement minima of the head (HD_{min}), pelvis (PD_{min}) and withers (WD_{min}) was calculated for each stride. Horses with unilateral forelimb lameness (n=63) and horses with unilateral hindlimb lameness (n=36) where diagnostic analgesia decreased the lameness were included in the statistical analysis. Mean HD_{min}, PD_{min} and WD_{min} were compared before and after diagnostic analgesia using a paired t-test. Asymmetry of head and withers, but not pelvic, movement significantly decreased in the forelimb lame horses ($P<0.01$). For the hindlimb lame horses, all three variables decreased ($P<0.001$). Horses with forelimb lameness presented with unidirectional head and withers movement asymmetry, whereas horses with hindlimb lameness showed head and withers asymmetry of opposite directions and the head asymmetry was ipsilateral to the hindlimb asymmetry. This study illustrates how compensatory patterns in horses with naturally occurring lameness are similar to those in horses with induced lameness. Therefore, the direction of movement symmetry of the withers can be used to discriminate true forelimb lameness from compensatory head movement asymmetry caused by primary hindlimb lameness.