



Locomotie/kreupelheid

Gómez Alvarez et al., 2007a:

Reasons for performing the study: Lameness has often been suggested to result in altered movement of the back, but there are no detailed studies describing such a relationship in quantitative terms.

Objectives: To quantify the effect of induced subtle forelimb lameness on thoracolumbar kinematics in the horse.

Methods: Kinematics of 6 riding horses was measured at walk and at trot on a treadmill before and after the induction of reversible forelimb lameness grade 2 (AAEP scale 1-5). Ground reaction forces (GRF) for individual limbs were calculated from kinematics.

Results: The horses significantly unloaded the painful limb by 11.5% at trot, while unloading at walk was not significant. The overall flexion-extension range of back motion decreased on average by 0.2° at walk and increased by 3.3° at trot ($p < 0.05$). Changes in angular motion patterns of vertebral joints were noted only at trot, with an increase in flexion of 0.9° at T10 (i.e. angle between T6, T10 and T13) during the stance phase of the sound diagonal and an increase in extension of the thoracolumbar area during stance of the lame diagonal (0.7° at T13, 0.8° at T17, 0.5° at L1, 0.4° at L3 and 0.3° at L5) ($p < 0.05$). Lameness further caused a lateral bending of the cranial thoracic vertebral column towards the lame side (1.3° at T10 and 0.9° at T13) ($p < 0.05$) during stance of the lame diagonal.

Conclusions: Both range of motion and vertebral angular motion patterns are affected by subtle forelimb lameness. At walk, the effect is minimal, at trot the horses increased the vertebral range of motion and changed the pattern of thoracolumbar motion in the sagittal and horizontal planes, presumably in an attempt to move the centre of gravity away from the lame side and reduce the force on the affected limb.

Potential relevance: Subtle forelimb lameness affects thoracolumbar kinematics. Future studies should aim at elucidating whether the altered movement patterns lead to back and/or neck dysfunction in the case of chronic lameness.

Gómez Alvarez et al., 2007b:

Reasons for performing the study: Hindlimb lameness has often been suggested to cause altered motion of the back, but there are no detailed studies describing such a relationship.

Objectives: To quantify the effect of induced subtle hindlimb lameness on thoracolumbar kinematics in the horse.

Methods: Kinematics of 6 riding horses was measured during walk and trot on a treadmill before, during and after the application of pressure on the sole of the left hindlimb using a well-established sole pressure model. Reflective markers were located at anatomical landmarks on the limbs, back, head and neck for kinematic recordings. Ground reaction forces (GRF) in individual limbs were calculated from kinematics to detect changes in loading of the limbs.

Results: When pressure on the sole of the hindlimb was present, the horses were judged as lame (grade 2 on the AAEP scale 1-5) by an experienced clinician. No significant unloading of this limb was found in the group of horses (unloading was observed in 4 and it was not detectable in the other 2), but statistically significant effects on back kinematics were detected. The overall flexion-extension (FE) range of motion (ROM) of the vertebral column was increased at walk, especially in the thoracic segments. Axial rotation (AR) ROM of the pelvis was also increased. At trot, the FE ROM was decreased only in the segment L3-L5-S3. During the stance phase of the lame limb, the segment T6-T10-T13 was more flexed and the neck was lowered at both gaits; the thoracolumbar segments were



more extended at walk and trot. There were no significant changes in the stride length or protraction-retraction angles in any of the limbs.

Conclusions: Subtle hindlimb lameness provoked slight but detectable changes in thoracolumbar kinematics. The subtle lameness induced in this study resulted in hyperextension and increased ROM of the thoracolumbar back, but also in decreased ROM of the lumbosacral segment and rotational motion changes of the pelvis.

Potential relevance: Even subtle lameness can result in changes in back kinematics, which emphasises the intricate link between limb function and thoracolumbar motion. It may be surmised that, when chronically present, subtle lameness induces back dysfunction.

References

1. Gómez Alvarez CB, Wennerstrand J, Bobbert MF, Lamers L, Johnston C, Back W, van Weeren PR. (2007a). The effect of induced forelimb lameness on thoracolumbar kinematics during treadmill locomotion. *Equine Vet J.*, 39(3):197-201.
2. Gomez Alvarez CB, Bobbert MF, Lamers L, Johnston C, Back W, van Weeren PR. (2007b). The effect of induced hindlimb lameness on thoracolumbar kinematics during treadmill locomotion. *Equine Vet J.*, 40(2):147-152.