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Reasons for performing study: Arena surfaces used for training and competition are influenced by factors such as weather and maintenance, which can lead to spatial variations in functional surface properties. The ability of the horse to adapt to such changes may have implications for injury prevention [1].

Objectives: The aim of the study was to quantify kinematic and neuromuscular responses of horses to an abrupt change in functional surface properties.

Study design: Experimental, within-subject.

Methods: Horses ($n = 7$) were trotted in hand at a consistent speed (3.84 ± 0.25 m/s) eight times across a waxed sand and fibre surface that presented a camouflaged, abrupt change from firmer (replicated peak force; 13.59 ± 0.39 kN) to softer (12.38 ± 0.81 kN) conditions. Kinematic data (232 Hz) synchronised with surface electromyography (sEMG) (2088 Hz) from selected forelimb muscles were recorded. The first trial (no awareness of change) was categorised separately to the subsequent trials (2–8; aware of change). A General Linear Model was used to assess the effect of horse, surface preparation and awareness on kinematics and sEMG.

Results: Horse had a significant ($P < 0.0001$) effect on kinematics. Forelimb retraction angle significantly ($P < 0.0001$) reduced by 0.72° as the horse stepped onto the softer surface. Awareness of the abrupt change also significantly ($P = 0.005$) reduced forelimb retraction angle by 0.53° . The mean neuromuscular activity within the forelimb muscles (with the exception of the *extensor carpi radialis*) during stance also reduced on the softer surface.

Conclusions: Reducing forelimb retraction appears to be the main alteration that horses make to cope with an abrupt change in surface. This would suggest a more caudal centre of mass position relative to forelimb at lift off, which may aid balance.

Ethical animal research: The study was approved by the University of Central Lancashire's ethics committee (RE/13/01/SH). Owners provided informed consent. **Sources of funding:**

The study was funded by Myerscough College and University of Central Lancashire.

Competing interests: None declared.

Reference

1. Parkes, R.S.V. and Witte, T.H. (2015) The foot–surface interaction and its impact on musculoskeletal adaptation and injury risk in the horse. *Equine Vet. J.* **47**, 519–525.