Effect of Arena Surface Composition on Shear Ground Reaction Forces

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Shear mechanical behavior is more dependent on surface compositional properties than surface type categories (dirt/synthetic). Authors’ addresses: JD Wheat Veterinary Orthopedic Research Laboratory (Rohlf, Garcia-Nolen, Stover), Biomedical Engineering Graduate Group (Rohlf, Fyhrie, Stover), Department of Surgical and Radiological Sciences (Rohlf, Garcia-Nolen, le Jeune, Stover), University of California, Davis, CA 95616; Racing Surfaces Testing Laboratory, University of Kentucky, Lexington, KY 40502 (Peterson); e-mail: cmrohlf@ucdavis.edu. *Corresponding and presenting author. © 2021 AAEP.

1. Introduction
Shear forces at the surface-hoof interface affect hoof slide and surface grip, influence forces transferred to the limb, and affect injury risk. The influence of surface composition and management on shear ground reaction forces were quantified.

2. Materials and Methods
Shear force was measured at 4 sites on 12 arena surfaces (5 dirt; 7 synthetic) with 5 increasing normal loads. Surface composition, surface temperature, cushion depth, and moisture content were also measured. Coefficient of friction and adhesion were calculated from shear data. The effects of surface on shear properties were assessed using ANOVA (p < 0.05). Surface composition was correlated with shear properties.

3. Results
Adhesion and coefficient of friction were not different between dirt and synthetic surface categories. Correlations between adhesion and coefficient of friction with surface fiber content were observed. These trends predict that more fiber will decrease soil adhesion (r = −0.75; p < 0.01) and increase the coefficient of friction (r = 0.81; p < 0.01).

4. Discussion
Although surface type (dirt, synthetic) was expected to significantly affect shear surface properties, no significant relationships were found. However, when looking at surface type as a gradient with the percentage of fiber content, significant relationships between compositional and shear...
properties were observed. This suggests that arena owners can influence shear mechanical behavior of a surface by adjusting fiber content; however, future studies are necessary to directly determine the relationship of shear surface properties and equine musculoskeletal health.

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Declaration of Ethics

The Authors have adhered to the Principles of Veterinary Medical Ethics of the AVMA.

Conflict of Interest

The Authors have no conflicts of interest.