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Reasons for performing study: Athlete guided assessments of equestrian arena surfaces can help provide information on the perceived importance of surface functional properties.

Objectives: To investigate how rider-assessed overall rating of showjumping competition and warm-up arenas relate to subjective perception and objective measurements of specific functional properties of the arenas.

Study design: Observational.

Methods: Twenty-five show jumping arenas in nine 5 and 4* events were subjectively evaluated by 198 riders participating in the competitions, giving 669 arena evaluations. Riders gave an overall rating and rated six functional characteristics on visual analogue scales: impact firmness, cushioning, responsiveness, grip, uniformity and consistency. The Orono Biomechanical Surface Tester was used to objectively measure peak acceleration (impact firmness), peak load (cushioning), forward hoof slide during loading (grip), quotient of the compression and recoil time (responsiveness), and mean of coefficients of variations for all parameters (uniformity) on all arenas (consistency was not measured). The subjective assessments and objective measurements were used as explanatory variables in mixed models created to investigate how they affected the riders' overall arena ratings. Arena, rider and rider-event clustering was controlled for ($P < 0.05$).

Results: Subjectively, impact firmness had significant two-way interactions with cushioning ($P < 0.0001$), responsiveness ($P = 0.001$) and consistency ($P = 0.007$) when explaining overall score. Estimated effect of uniformity on overall score was 1.39 ($P < 0.0001$). Grip did not have a significant effect. Objectively, cushioning interacted with responsiveness and grip

influencing the overall score; interaction of grip with responsiveness was also found. Impact firmness and uniformity had no significant effect.

Conclusions: The riders preferred higher firmness, less cushioning (more compacted), more responsive and more uniform surfaces during competition (subjectively assessed), referring to the spectrum of surfaces used at this competition level. The interacting effects of both subjective and objective surface properties emphasises the need to consider several functional properties to elucidate surface performance.

Ethical animal research: Participating riders gave their consent to be included in the study.

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