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The Mechanical Interaction of Hoof and Track Surface in Racehorses

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Catastrophic failure and chronic performance-inhibiting injury are facts of life in the horse racing industry. Reducing the frequency of occurrence of both is a major concern. One of a large number of risk factors that has been identified is the variability in properties between training and racing tracks. The purpose of this study was to quantify the effect of 4 different track surfaces on the impact of the hoof with the track. The primary data were the triaxial accelerations recorded during 10 footfalls from 10 horses running on each surface. Conventional analyses use scalar variables and frequencies on each axis separately. In this presentation, I will describe a novel application of the Serret-Frenet apparatus to parameterise the 3-D curves of acceleration data in terms of torsion and curvature. The results clearly distinguish among the surfaces, and give an indication of the variability in impact of the hoof on each one. This study has produced a method that may be useful in assessing cause-and-effect, rather than just risk, between surface variability and frequency of injury in equine athletes.