

# Comparative performance of playground surfacing materials including conditions of extreme non-compliance

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**Objective:** A recent case series study found that only 4.7% of 402 playgrounds in which arm fractures occurred in Victorian schools complied with the recommended 20 cm depth of tanbark. Tanbark depths at fall sites varied between 0–27 cm and the mean was 11.1 (5.0) cm. The purposes of the present study were to (1) measure impact attenuation properties of shallow and compacted depths of tanbark; (2) validate laboratory measurements with in situ data; (3) compare impact attenuation properties of compacted tanbark with an Australian manufactured rubber based surface material; and (4) study the impact performance of rubber and tanbark hybrid surfacing.

**Methods:** A standard test headform was dropped on tanbark and rubber surfaces in a laboratory setting to measure peak impact deceleration and head injury criterion (HIC) values. Variations in surface depth ranged from 2 cm–20 cm (tanbark) and 2 cm–9 cm (rubber). Drop height ranged from 0.5 m–2.5 m.

**Results:** Peak deceleration and HIC increased with increasing drop height and decreasing surface depth. Laboratory measurements at depths less than 8 cm overestimated peak deceleration and HIC values compared with in situ playground measurements. Impact attenuation of a 9 cm thick bilaminate rubber material was comparable to that of an 18 cm depth of compacted tanbark. Rubber-tanbark hybrid surfaces showed improved impact attenuation over individual surfaces.

**Conclusions:** Compacted tanbark of depth less than 8 cm is ineffective in attenuating playground falls, resulting in excessive impact deceleration and HIC values. Shallow and compacted tanbark found in many Victorian school playgrounds poses a high risk for severe head injury. This calls for stricter enforcement of playground surface depth compliance.