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KIDS DON'T BOUNCE! THE MEASUREMENT OF SURFACE PERFORMANCE IN PUBLIC PLAYGROUNDS[1]

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BACKGROUND

Playground injuries are an important source of childhood injury. Surfacing is the top priority for injury prevention initiatives, since the majority of significant injuries are due to falls from playground equipment to the ground surface. The risk of injury is directly related to the height of the fall and the shock-absorbing properties of the impact surface. Serious head injuries are believed to occur when the impact exceeds 200Gs. The safety of local public playground surfaces is unknown, in terms of surface performance, and is the focus of this study.

OBJECTIVES

To describe the impact attenuation performance of public playground surfaces for varying surface materials and depths, and to validate playground inspection techniques such as depth measurement.

METHODS

The Sample

Testing was performed at a random sample of public playgrounds stratified by surface type (sand, pea gravel, grass).

The Accelerometer

A portable tri-axial accelerometer was used to measure surface performance in a sample of public playgrounds. This instrument measures deceleration forces (G) and calculates Head Injury Criteria scores (HIC).

Variables measured

- At each site, the accelerometer was dropped from 1m, 2m, 3m, and from the highest piece of playground equipment, in the most worn fall zones, to measure G and HIC values.
- Surface depth was measured by three techniques: spade, probe 1 (5/16 inch sharpened metal probe), probe 2 (3/4 inch blunt probe).
- Environmental data were collected, including ambient and surface temperature and recent precipitation.

RESULTS

- A total of 257 drop sites were tested, representing 68 playgrounds
- Testing included sand (n=103), pea gravel (n=114) and grass (n=40) surfaces.

SURFACE PERFORMANCE

- Surface performance did not differ significantly between surface types at any of the standard heights (1m,2m,3m).
- Surface performance measures correlated poorly with two of the three surface depth measures (spade, probe 2).

FAILURES OF SURFACE PERFORMANCE

- Using peak deceleration measures (G), 21% of sand, 32% of pea gravel and 13% of grass surfaces failed to perform adequately (G >200).
- Using HIC criteria, 22% of sand, 25% of pea gravel, and 18% of grass surfaces failed to perform adequately (HIC > 1000).
- Of note, several playgrounds failed to perform adequately at low fall heights (1m and 2m). At 2m, 20% of drops failed using G criteria and 27% failed used HIC criteria.

CONCLUSIONS

A significant proportion of playgrounds tested failed to meet current recommendations for surface performance. Measures of depth used commonly in field testing of playgrounds correlate poorly with surface performance, and warrant further research.

Measures of surface performance, such as peak deceleration, are objective methods of documenting the adequacy of playground surfaces, however practical application in routine playground inspection will require further research.

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