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Home > [Journal of Athletic Training](#) > [May/June 2010](#) > A Description of Shock Attenuation for Children Running

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Original Research

A Description of Shock Attenuation for Children Running

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Abstract

Context: A growing number of children are participating in organized sport activities, resulting in a concomitant increase in lower extremity injuries. Little is known about the impact generated when children are running or how this impact is attenuated in child runners.

Objective: To describe shock attenuation characteristics for children running at different speeds on a treadmill and at a single speed over ground.

Design: Prospective cohort study.

Setting: Biomechanics laboratory.

Patients or Other Participants: Eleven boys (age = 10.5 ± 0.9 years, height = 143.7 ± 8.3 cm, mass = 39.4 ± 10.9 kg) and 7 girls (age = 9.9 ± 1.1 years, height = 136.2 ± 7.7 cm, mass = 35.1 ± 9.6 kg) participated.

Intervention(s): Participants completed 4 running conditions, including 3 treadmill (TM) running speeds (preferred, fast [0.5 m/s more than preferred], and slow [0.5 m/s less than preferred]) and 1 overground (OG) running speed.

Main Outcome Measure(s): We measured leg peak impact acceleration (LgPk), head peak impact acceleration (HdPk), and shock attenuation (ratio of LgPk to HdPk).

Results: Shock attenuation ($F_{2,16} = 4.80$, $P = .01$) was influenced by the interaction of speed and sex. Shock attenuation increased across speeds (slow, preferred, fast) for boys ($P < .05$) but not for girls ($P > .05$). Both LgPk ($F_{1,16} = 5.04$, $P = .04$) and HdPk ($F_{1,16} = 6.04$, $P = .03$) were different across speeds, and both were greater for girls than for boys. None of the dependent variables were influenced by the interaction of setting (TM, OG) and sex ($P \geq .05$). Shock attenuation ($F_{1,16} =$

Volume 45, Issue 3 (May/June 2010)

[< Previous](#) [Next >](#)



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33.51, $P < .001$) and LgPk ($F_{1,16} = 31.54$, $P < .001$) were different between TM and OG, and each was greater when running OG than on the TM, regardless of sex.

Conclusions: Shock attenuation was between 66% and 76% for children running under a variety of conditions. Girls had greater peak impact accelerations at the leg and head levels than boys but achieved similar shock attenuation. We do not know how these shock attenuation characteristics are related to overuse injuries.

Keywords: [boy and girl runners](#), [impact](#), [lower extremity injuries](#)

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[top](#) [#]

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