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The long-term effects of wearing moderate minimalist shoes on a child's foot strength, muscle structure and balance: A randomised controlled trial

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Abstract

Background: From retrospective research, it is believed that children who predominantly spend their time shod have poorer foot strength and performance than those who are predominantly barefoot. Children's foot motion has been shown to be adversely affected by standard school shoes; however, the long-term effect of moderate minimalist shoes on foot strength, muscle structure and balance in children is unknown.

Research question: Does wearing moderate minimalist shoes, compared to stiff shoes, benefit a child's foot strength, muscle structure and performance over time?

Methods: Seventy healthy children (9-12 yr) were randomly assigned to wear standard (control), or minimalist shoes (experimental) at school, for nine months. Cross-sectional areas (CSA) of Abductor Hallucis (AH) and Flexor Digitorum Brevis (FDB) muscles, and toe flexor strength (TFS) of hallux and lesser toes separately, were primary outcome measures. Single leg balance (SLB), Y-balance test (YBT) and standing long jump (SLJ) were secondary outcome measures. Pre- and post-intervention measurements were analysed for between group differences with ANCOVA.

Results: Minimalist shoes resulted in moderate but statistically non-significant increases in muscle CSA (AH η^2_p =.04, FDB η^2_p =.05) and TFS (hallux η^2_p =.05, lesser toes η^2_p =.04). Significant moderate to large improvements in YBT in the experimental group were found in the postero-medial (P = .04, η^2_p =.07) and postero-lateral (P = .01, η^2_p =.10) directions. YBT (anterior, postero-medial and postero-lateral) was correlated with hallux TFS (R =.29,.27 and.33 respectively), lesser toes TFS (R =.28,.35 and.38 respectively) and SLJ (R =.30,.39 and.57 respectively). CSA of FDB was correlated with SLJ (R =.34) and SLB (R =.42).

Significance: Wearing moderate minimalist shoes long-term improves balance in children. TFS is correlated with better balance and SLJ. Moderate minimalist school shoes are recommended for children.

Keywords: Balance; Child; Footwear; Performance outcomes; Toe flexor strength; Ultra-sound.

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