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THE INFLUENCE OF SHOE AGING ON CHILDREN RUNNING BIOMECHANICS

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Highlights

- 14 children performed a running task with new shoes and used shoes
- GRF loading rate increased by 23% in used shoes compared to new shoes
- Peak ankle and knee power absorptions decreased by 11% and 12% in used shoes

ABSTRACT

Athletic children are prone to overuse injuries, especially at the heel and knee. Since footwear is an extrinsic factor of lower limb injury risk, the aim of this study was to assess the influence of shoe aging on children running biomechanics. Fourteen children active in sports participated in a laboratory biomechanical evaluation. A new pair of shoes was provided to each participant at an inclusion visit. Four months later, the participants performed a running task and their kinematics and kinetics were assessed both with their used shoes and with a new pair of shoes identical to the first. Furthermore, mechanical cushioning properties of shoes were evaluated before and after in-vivo aging. After 4 months of use, the sole stiffness increased by 16% and the energy loss capacity decreased by 18% ($p < 0.001$). No ankle or knee kinematic adjustment was found at foot strike in used shoes but changes were observed later during stance. Running with used shoes produced a higher loading rate of the vertical ground reaction force (+23%, $p = 0.016$), suggesting higher compressive forces under the heel and placing children at risk to experience impact-related injuries. Nevertheless, the decreased peak ankle and knee power absorption in used shoes (-11%, $p = 0.010$ and -12%, $p = 0.029$, respectively) suggests a lower ankle and knee joints loading during the absorption phase that may be beneficial regarding stretch-related injuries.

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