IJSPT

ORIGINAL RESEARCH

CAN RUNNERS PERCEIVE CHANGES IN HEEL CUSHIONING AS THE SHOE AGES WITH INCREASED MILEAGE?

Mark W. Cornwall, PT, PhD, FAPTA[1]
Thomas G. McPoil, PT, PhD, FAPTA[2]

ABSTRACT

Background: For those runners who utilize footwear and have a rearfoot strike pattern, the durability of the midsole heel region has been shown to deteriorate as shoe mileage increases.

Purpose: The purpose of this study was threefold: 1) to determine if the runner can self-report changes in heel cushioning properties of the midsole after an extended period of distance running, 2) to determine if force and plantar pressures measured in the heel region of the midsole using a capacitance sensor insole change after running 640 km, and 3) to determine if a durometer could be used clinically to objectively measure changes in the hardness of the material in the heel region of the midsole.

Study Design: Cross-sectional Study

Methods: Fifteen recreational runners voluntarily consented to participate and were provided with a new pair of running shoes. Each participant's running style was observed and classified as having a rearfoot strike pattern. Inclusion criteria included running at least 24 km per week, experience running on a treadmill, no history of lower extremity congenital or traumatic deformity, or acute injury six months prior to the start of the study. The ability of each participant to self-perceive changes in shoe cushioning, comfort and fit was assessed using the Footwear Comfort Assessment Tool (FCAT). In-shoe plantar pressures and vertical forces were assessed using a capacitance sensor insole while runners ran over a 42-meter indoor runway. A Shore A durometer was used to measure the hardness of the midsole in the heel region. All measures were completed at baseline (zero km) and after running 160, 320, 480, and 640 km. In addition to descriptive statistics, a repeated measures analysis of variance was used to determine if the FCAT, pressures, forces, or midsole hardness changed because of increased running mileage.

Result: While plantar pressures and vertical forces were significantly reduced in the midsole heel region, none of the runners self-reported a significant reduction in heel cushioning based on FCAT scores after running 640 km. The use of a durometer provided an objective measure of the changes in the heel region of the midsole that closely matched the reductions observed in pressure and force values.

Conclusion: The results indicated that runners who have a rearfoot strike pattern will have a 16% to 33% reduction in the amount of cushioning in the heel region of the midsole after running 480 km. Although there were significant reductions in heel cushioning, the experienced recreational runners in this study were not able to self-perceive these changes after running 640 km. In addition, the use of a durometer provides a quick and accurate way to assess changes in the hardness of the heel region of the midsole as running mileage increases.

Level of Evidence: 3, Controlled laboratory study

Key words: Durometer, force, midsole, plantar pressure, running

CORRESPONDING AUTHOR
Thomas G. McPoil, PT, PhD
School of Physical Therapy
Regis University
3333 Regis Blvd., G-4
Denver, CO, 80221
Phone: 303 964-5137
E-mail: tmcpoil@regis.edu

[1] Department of Physical Therapy and Athletic Training, Northern Arizona University, Flagstaff, AZ
[2] School of Physical Therapy, Regis University, Denver, CO