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Midfoot Angle Changes During Running After an 8-week Foot Strengthening Program

Sarah Ridge, PhD, Adrienne Henderson, BS, Dustin Bruening, PhD, Kevin Jurgensmeier, BS, Mark Olsen, MS, David Griffin, BS, Aaron Johnson, PhD, PT, Irene Davis, PhD, PT

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Introduction/Purpose: The arch has been referred to as the core of the foot. The arch's structure, movement, and integrity during running gait largely depends on the function of intrinsic and extrinsic foot muscles. There are many injuries that can be associated with a dysfunctional medial longitudinal arch. Improving the strength of the foot muscles could help improve arch function during running. The purpose of this study was to compare changes in arch deformation after eight weeks in a foot strengthening exercise group (FS), a group walking in minimalist shoes (MSW), and a control group (C).

Methods: 24 healthy runners (average of 15-30 miles/week, no experience with minimalist footwear) were randomly assigned to FS (n=9), MSW (n=7) or C (n=8). FS subjects followed a series of progressive exercises designed to strengthen the intrinsic and extrinsic foot muscles. MSW subjects walked in minimal footwear, increasing from 2,500 to 7,000 steps/day over an 8 wk period. All runners maintained their pre-study mileage in conventional running shoes throughout the 8-week study Three-dimensional motion analysis data was collected at the beginning of the study and after week 8. Passive-reflective markers were placed according to the Oxford Foot Model. Subjects ran at a self-selected pace on a treadmill while data were collected for at least 10 strides. Peak midfoot angles were extracted and averaged within each trial. Group means at week 0 and week 8 were compared using paired t-tests with alpha set at 0.05.

Results: While all groups experienced a decrease in midfoot angle, only the FS group experienced a significant change (see table). These results suggest that the foot exercise intervention resulted in more arch control during running than the progressive walking in minimal shoes. Greater changes may have been found if the subjects progressively ran in the minimal shoes which would have placed greater demands on the arch musculature.

Conclusion: Based on these data, it seems possible for patients to reduce the amount of arch deformation during running by using targeted foot exercises. This could help with patients who have overuse injuries associated with increased arch deformation. These results also suggest that foot strengthening may be an effective way to prepare for minimal footwear running.

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