

ORIGINAL RESEARCH

THE EFFECT OF STEP RATE MANIPULATION ON FOOT STRIKE PATTERN OF LONG DISTANCE RUNNERS

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ABSTRACT

Purpose/Background: Running gait retraining to change foot strike pattern in runners from a heel strike pattern to a non heel- strike pattern has been shown to reduce impact forces and may help to reduce running related injuries. Step rate manipulation above preferred is known to help decrease step length, foot inclination angle, and vertical mass excursion, but has not yet been evaluated as a method to change foot strike pattern. The purpose of this study was to investigate the effect of step rate manipulation on foot strike pattern in shod recreational runners who run with a heel strike pattern. A secondary purpose was to describe the effect of step rate manipulation at specific percentages above preferred on foot inclination angle at initial contact.

Methods: Forty volunteer runners, who were self-reported heel strikers and had a weekly running mileage of at least 10 miles, were recruited. Runners were confirmed to be heel strikers during the warm up period on the treadmill. The subject's step rate was determined at their preferred running pace. A metronome was used to increase step rate above the preferred step rate by 5%, 10% and 15%. 2D video motion analysis was utilized to determine foot strike pattern and to measure foot inclination angle at initial contact for each step rate condition.

Results: There was a statistically significant change in foot strike pattern from a heel strike pattern to a mid-foot or forefoot strike pattern at both 10% and 15% step rates above preferred. Seven of the 40 subjects (17.5%) changed from a heel- strike pattern to a non- heel strike pattern at +10% and 12 of the 40 subjects (30%) changed to a non-heel strike pattern at +15%. Mean foot inclination angle at initial contact showed a statistically significant change (reduction) as step rate increased.

Conclusion: Step rate manipulation of 10% or greater may be enough to change foot strike pattern from a heel strike to a mid-foot or forefoot strike pattern in a small percentage of recreational runners who run in traditional running shoes. If changing the foot strike pattern is the main goal, other gait re-training methods may be needed to make a change from a heel strike to a non-heel strike pattern. Step rate manipulation shows a progressive reduction of foot inclination angle at 5%, 10%, and 15% above preferred step rate which reduces the severity of the heel strike at initial contact. Step rate manipulation of at least +10% above preferred may be an effective running gait retraining method for clinicians to decrease the severity of heel strike and possibly assist a runner to change to a non-heel strike pattern.

Key Words: Foot strike pattern, running gait retraining, step rate manipulation

Level of Evidence: 3

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