Article

Influence of footwear temperature on the kinetics and kinematics of running

Sinclair, Jonathan Kenneth, Hobbs, Sarah Jane and Shore, Hannah

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It has been shown that 19.4–79.3% of all who participate in recreational running activities will suffer from a chronic pathology over the course of 1 year (Van Gent et al., 2007, *British Journal of Sports Medicine*, 41, 469–480). Female runners are known to be at increased risk from chronic injuries in relation to males, with the knee being the most common injury site (Robinson and Nee, *JOSPT*, 37, 232–238). There is currently a paucity of information regarding the influence of gender on the loads experienced by the patellar tendon during running. The aim of the current investigation was, therefore, to determine whether female recreational runners exhibit distinct patellar tendon loading patterns in relation to their male counterparts. Twelve male (age 26.55 ± 4.11 years, height 1.78 ± 0.11 m, mass 77.11 ± 5.06 kg) and 12 female (age 26.67 ± 5.34 years, height 1.67 ± 0.12 m, mass 63.28 ± 9.75 kg) runners ran over a force platform which operated at 1000 Hz, at 4.0 m . s^{-1}. Ethical approval was granted by the author's institution. Lower limb kinematics were collected using an eight-camera optoelectric motion capture system which operated at 250 Hz. Patellar tendon loads were examined using a predictive algorithm, whereby the knee extensor moment was divided by the patellar tendon moment arm (Janssen et al., 2012, *Medicine and Science in Sports Exercise*, 45, 927–934; Herzog and Read, 1993, *Journal of Anatomy*, 182, 213–230). Sex differences in patellar tendon loads were examined statistically using independent samples *t*-tests. The results indicate that peak patellar tendon force (male = 6.49 ± 2.28 and female = 7.03 ± 1.35 BW) and patellar tendon loading rate (male = 92.41 ± 32.51 and female = 111.05 ± 48.58 BW . s^{-1}) were significantly higher in female runners. On the basis that patellar tendon pathology is considered to be a function of excessive tendon loading, the current study indicates that female runners may be at increased risk of patellar tendon pathologies.

034. Influence of footwear temperature on the kinetics and kinematics of running

JONATHAN SINCLAIR*, SARAH JANE HOBBS & HANNAH SHORE

University of Central Lancashire
*Corresponding author: jksinclair@uclan.ac.uk

The most frequently utilised material for running shoe midsoles is a copolymer called ethylene-vinyl acetate. Like most polymers, ethylene-vinyl acetate exhibits viscoelastic properties (Knauss et al., 2008, *Mechanics of Polymers*: *Viscoelasticity* (pp. 49–96). Springer). It has long been established that the mechanical properties of most polymers are highly temperature dependent (Dib et al., 2001, *Journal of Sport Medicine*, 15, 172–176); at lower temperatures, the materials become less elastic, whereas the opposite occurs at higher temperatures. As such, it has been proposed that the cushioning characteristics of running shoes may differ in different environmental temperature conditions. The aim of the current investigation was to examine the effects of cooled footwear on the kinetics and kinematics of running in comparison to footwear at normal temperature. Twelve participants (age 21.45 ± 2.98 years, height 1.66 ± 0.06 m, mass 60.87 ± 4.37) ran at 4.0 m · s^{-1} ± 5% in both cooled and normal temperature footwear conditions over a force platform (1000 Hz). Ethical approval was granted by the author's institution. Two identical footwear were worn, one of which was cooled for 30 min. Lower extremity kinematics were obtained using a motion capture system (250 Hz), and tibial accelerations (1000 Hz) were measured using a tri-axial accelerometer. Differences between cooled and normal footwear temperatures were contrasted using paired samples *t*-tests. The results showed that midsole temperature (P = 0.004) and deformation (P = 0.001) were significantly reduced in the cooled footwear. In addition, instantaneous loading rate (P = 0.02), peak tibial acceleration (P = 0.01) and tibial acceleration slope (P = 0.007) were significantly greater in the cooled footwear. Finally, peak eversion (P = 0.02) and tibial internal rotation (P = 0.01) were also shown to be significantly larger in the cooled footwear condition. This study indicates that running in cooler footwear places runners at greater risk from the kinetic and kinematic parameters linked to the aetiology of injuries.

035. The effect of a real-time gait-retraining programme on knee angle and ground reaction forces in a group of recreational runners

LOULIA HADJIIOANNOU, ANDREW BARNES*, SEAN CLARKSON & JONATHAN WHEAT

Sheffield Hallam University
*Corresponding author: a.barnes@shu.ac.uk

Gait-retraining using real-time visual feedback is an effective intervention for modifying factors