THE IMPACT OF THREE DIFFERENT FOOTWEAR CONDITIONS ON INDIVIDUAL BIOMECHANICAL, PHYSIOLOGICAL AND PERCEPTUAL RESPONSES DURING RUNNING.

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ABSTRACT

Background: Despite the introduction of running footwear in the 1970’s, running injury rates continue to be unacceptably high. The subsequent revival of barefoot running and the introduction of minimalist footwear occurred, in an attempt to reduce injury rates and increase performance. There is much contention in the literature around the effectiveness of these footwear conditions. Furthermore individual responses have recently been proposed to provide more accurate and reflective conclusions than the use of mean data. Objectives: Twofold: a) to compare the biomechanical, physiological and perceptual responses between the shod, minimalist and barefoot footwear conditions and b) to assess and compare individual responses under these footwear conditions. Methods: 26 well-trained, male, habitually shod endurance runners, aged between 18 - 30 years completed three experimental sessions on an indoor runway and motorized treadmill. Each session was completed in either the shod, minimalist or barefoot condition, running at 15km.h-1. Variables assessed included stride rate, stride length, impact peak, vertical impact and average loading rate and strike time (biomechanical); heart rate, oxygen consumption and electromyography (physiological); and rating of perceived exertion and body discomfort (perceptual). Results: Biomechanics – Stride rate and stride length showed a significant (p<0.001) increase and decrease respectively when running in the minimalist or barefoot conditions versus shod. Running barefoot versus the minimalist and shod conditions resulted in a significantly (p<0.001) greater vertical impact loading rate. Strike time was significantly (p=0.008) reduced running in the minimalist and barefoot conditions versus shod. Physiology – Running barefoot versus shod resulted in a significantly (p=0.02) reduced heart rate and Tibialis Anterior activity (p=0.005). There was a large variability in individual responses for many variables, with responders and non-responders seen. Conclusion: The study suggests that there are significant differences between all three forms of running for some variables. It was further noted that there is support for the proposal that individual responses are highly variable and should be analysed accordingly.
Keywords: barefoot running, shod running, minimalist running, individual variability, biomechanics, physiology, perceptual responses, electromyography, responders, non-responders.