Differences in Commonly Utilized Performance Metrics Across Time After Wearing Minimalist Footwear

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Summary

Differences in footwear can induce changes in movement patterns that could potentially cause significant adaptations in foot and leg musculature when going through habituation periods. In this study, participants were supplied with minimalist footwear to wear for eight weeks. Across this time period, the participants visited the lab in person five times to collect hopping and jumping data. This data was used to calculate common performance metrics of reactive strength index (RSI) and normalized countermovement jump height. Linear mixed effects models were utilized for both RSI and jump height. It was inferred from the models that RSI was significantly lower in the final visit compared to the first. Males had significantly greater than expected RSI and normalized jump height in the minimalist shoes. The normalized jump height also greatly differed between the sexes. These results show that minimalist footwear can induce changes both acutely and across habituation periods.

Introduction

Transitioning from rigid, cushioned footwear to minimalist shoes can induce significant adaptations in the foot and lower leg musculature, potentially influencing various movement patterns and performance metrics. Common performance metrics include reactive strength index (RSI), which is commonly measured by using hopping trials, and countermovement jump height. The aim of this study was to evaluate the impact of minimalist footwear habituation on various performance metrics including RSI and jump height.

Methods

14 participants were fitted with minimalist footwear to wear for eight weeks. During this period, the participants had five lab visits where hopping and jumping trials were conducted. These visits occurred on day 0, day 7, day 14, day 28, and day 56. The participants completed 3 trials of 5 countermovement jumps and 3 trials of 10 hops in three conditions: while wearing minimalist footwear (Vivo), while wearing their typical shoes (TS), and while barefoot (BF). RSI was then calculated using Jump Height/Contact Time [1]. The countermovement jump heights were then normalized based on participant height. Two separate linear mixed effects models were fitted to account for participant variability, with RSI as the response variable in one and countermovement jump height as the response variable in the other. The fixed effects were condition, visit, and sex. Each model was fitted with a random effect for participants.

Results and Discussion

Results revealed that the participants' RSI values were significantly lower during their last visit compared to the baseline visit performance ($p < .01$). There was no significance between the first visit and any of the other visits, but the 3rd and 4th visit also showed a negative trend. Also, there was a significant interaction between sex and the Vivo condition for RSI. Males had higher values for RSI in the Vivo condition than expected ($p = .02$). Males also had a significantly higher normalized jump height than females in all conditions ($p < .01$).
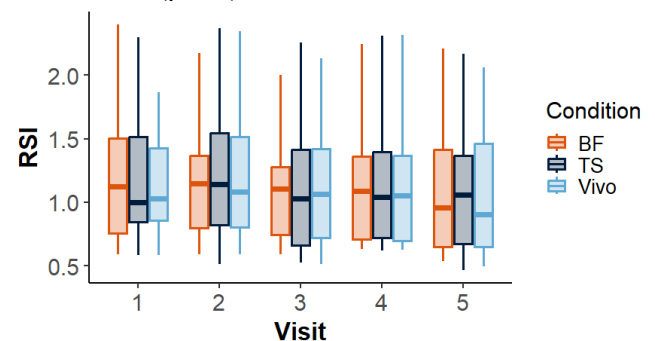

Figure 1: RSI by condition across all visits.

Conclusions

Habituating to minimalist shoes over eight weeks may have disrupted the participants' foot musculature, increasing the medio-longitudinal arch's ability to dissipate loads. A decrease in the rigidity of the foot could account for the decrease in performance shown in the results. Future studies will investigate whether these effects are exaggerated when analyzing a participant wearing the shoes for a longer period.

References

[1] McClymont, D. & Hore, A. (2004). *Journal of Sports Sciences, 23,* 65-78.