Comparative Effects of Advanced Footwear Technology on Running Economy in Track Spikes and Racing Shoes

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ABSTRACT

Advanced footwear technology, such as highly-cushioned midsoles with carbon-fiber plates, has been shown to improve running economy (RE) in road racing shoes. More recently, similar features have been incorporated into track spikes; however, the impact of advanced spikes on RE has yet to be quantified. Furthermore, there has been no comparison of advanced spikes to advanced shoes. **PURPOSE**: Quantify the RE benefit of advanced track spikes compared to a control spike and determine whether RE is optimized more in an advanced racing shoe or an advanced track spike. **METHODS**: Four racing shoes (3 advanced, 1 control) and 3 track spikes (2 advanced, 1 control) were tested in 9 male and 2 female distance runners on 2 separate visits. Shoes were tested in a random sequence over 5-minute trials (Males: 7 trials at 16 km $\cdot$hr^{-1}; Females: 5 trials at 14 km $\cdot$hr^{-1}; 5-minute rest between trials) on Visit 1, and in the reverse/mirrored order on Visit 2. Male subjects tested all 7 footwear conditions, whereas female subjects only tested the 4 racing shoes and 1 advanced track spike due to some spike models being out of stock. Metabolic and running mechanics data were collected and averaged across visits. **RESULTS**: VO$_2$ (mL $\cdot$kg^{-1} $\cdot$min^{-1}) was 2.1 ± 1.0% lower in the first advanced spike (49.1 ± 1.7) and 1.8 ± 1.0% lower in the other advanced spike (49.3 ± 1.7) relative to the control spike (50.2 ± 1.6). These differences were statistically significant ($p < 0.001$, n = 9). When comparing the subjects' most economic shoe (47.5 ± 3.7) against their most economic spike (47.5 ± 3.7), there were no statistical differences ($p > 0.99$, n = 11). However, on an individual level, we identified 7 of 11 subjects who showed a greater than 0.5% RE difference between their best shoe and spike, 4 of which favored a shoe and 3 a spike. **CONCLUSIONS**: Advanced footwear technology in track spikes improved RE ~2% relative to a traditional spike. Despite their heavier mass, advanced shoes resulted in similar RE as advanced spikes. This could make the advanced shoe an attractive option for longer duration track races, particularly in NCAA and high school athletics where there are no stack height rules. Finally, despite these group averaged similarities between advanced shoes and spikes, some individuals might benefit from individual RE testing to determine optimal footwear selection to enhance RE.