

FOOTWEAR COMFORT AND RUNNING PERFORMANCE

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INTRODUCTION

Comfort is an important aspect for footwear. It has been shown that footwear comfort has an influence on injury [1]; however, whether it affects athletic performance has yet to be proven. Therefore, the purpose of the current study was to determine if footwear comfort is related to running economy.

METHODS

Thirteen proficient male runners (age: 23.8 ± 3.4 years; body mass: 75.2 ± 7.4 kg) provided informed written consent to participate in this study. All participants were physically active and free of lower extremity pain and injury for a minimum of six months before the testing.

Five shoe conditions of the same mass but different mechanical characteristics were evaluated by the participants to determine each participant's most and least comfortable shoe conditions. All shoes were covered by Neoprene shoe shrouds to minimize the influence of visual feedback. To determine repeatability, a repeat condition was evaluated after the comfort assessments for the five shoe conditions.

Ventilatory aerobic threshold, anaerobic threshold and $\dot{V}O_{2max}$ of each participant were determined in maximal aerobic power testing sessions. Within the next two weeks, the participants returned to the laboratory for two treadmill running economy testing sessions, one session had the testing sequence of m-l-l-m while the other session had l-m-m-l (where m and l corresponded to the "most" and the "least" comfortable shoe conditions). Each economy run was of 6-minute duration. The initial 4 minutes allowed the participants to reach a steady state. The $\dot{V}O_2$ values were then measured every 30 seconds for the last 2 minutes and were averaged to calculate the mean oxygen consumption for the particular footwear condition.

A one-tailed paired t-test was performed to compare the average oxygen consumption between the most and least comfortable shoe conditions ($\alpha=0.05$).

RESULTS AND DISCUSSION

The intraclass correlation coefficient test revealed a good reliability (ICC = 0.76) for the repeated comfort assessments.

A significant effect of shoe comfort on $\dot{V}O_2$ was found ($p=0.036$). Eight out of the ten participants showed a decrease (up to 1.9%) in oxygen consumption for the most comfortable shoe (Figure 1). The mean oxygen consumption was 0.28 ml/kg/min (0.7%) lower for the "most" compared to the "least" comfortable shoe condition.

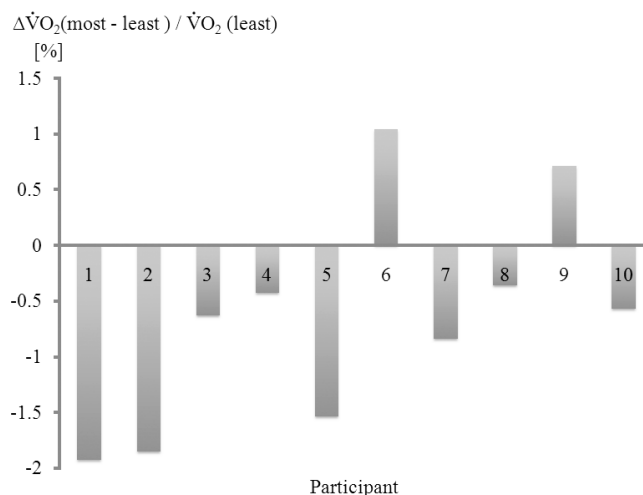


Figure 1: Individual normalized differences in oxygen consumption between the most and least comfortable shoe conditions. Negative values indicate reduced oxygen consumption in the most comfortable compared to the least comfortable shoe.

In elite track-and-field events, it has been indicated that performance enhancements as little as 0.3 – 0.5% are worthwhile [2]. Although it has yet to be proven whether the improved economy will result in an equivalent performance enhancement, it is reasonable to assume the 0.7% change in running economy is significant for elite runners.

Comfort has been proposed to be an indicator of muscle physiological work [3]. Recently, it has been found that comfort could partially be explained by the activity of the tibialis anterior and peroneus longus muscles [4]. It is universally accepted that local muscle activities are in direct relationship with global oxygen consumption. Thus, the relationship found between muscle physiological work and perceived comfort may help explain the current finding of lower oxygen consumption in the most comfortable shoe condition.

CONCLUSIONS

Improved footwear comfort significantly reduced the oxygen consumption during distance running.

REFERENCES

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