

The impact of footwear and running surface on sprint performance

Haugen, TH.^{1,2}, Tønnessen, E.¹, Seiler, S.²

¹ The Norwegian Olympic Federation of Sports (Oslo, Norway), ² University of Agder (Kristiansand, Norway)

Introduction

Speed is a key performance factor in many sport disciplines. Sprint performance differences that separate the excellent from the average are relatively small on an absolute scale, and the effects of training interventions are even smaller. Valid and reliable timing and test procedures are therefore critical for effective monitoring of sprinting performance. To the authors' knowledge, no studies have so far investigated possible differences in sprint times between spike shoes and regular jogging shoes among athletic sprinters. Similarly, it is unknown whether soccer players run faster with spike shoes (to which they are unaccustomed) compared to their regular soccer shoes when they are tested on an athletics track. The purpose of this study was to evaluate and quantify the effect of footwear and running surface on sprint performance.

Methods

21 track & field athletes and 34 soccer players in the age range 16-26 yr participated. The track and field athletes performed two sets of three 40m sprints in randomized order under the following conditions: a) spike shoes on a special purpose athletics rubberized surface (normal conditions for sprinters), b) jogging shoes on athletics rubberized surface, and c) jogging shoes on artificial turf. All athletic sprinters used their regular jogging shoes and running spike shoes during the tests. For the soccer players, the following conditions were designed: a) artificial turf shoes on artificial turf (normal conditions for soccer players), b) artificial turf shoes on athletics rubberized surface, and c) spike shoes on athletics rubberized surface (athletics sprinting conditions). All soccer players used their regular artificial turf shoes during the tests. During the spike shoe sprints, the soccer players used Nike Zoom Rival D 6 (Nike, Beaverton, USA) as footwear.

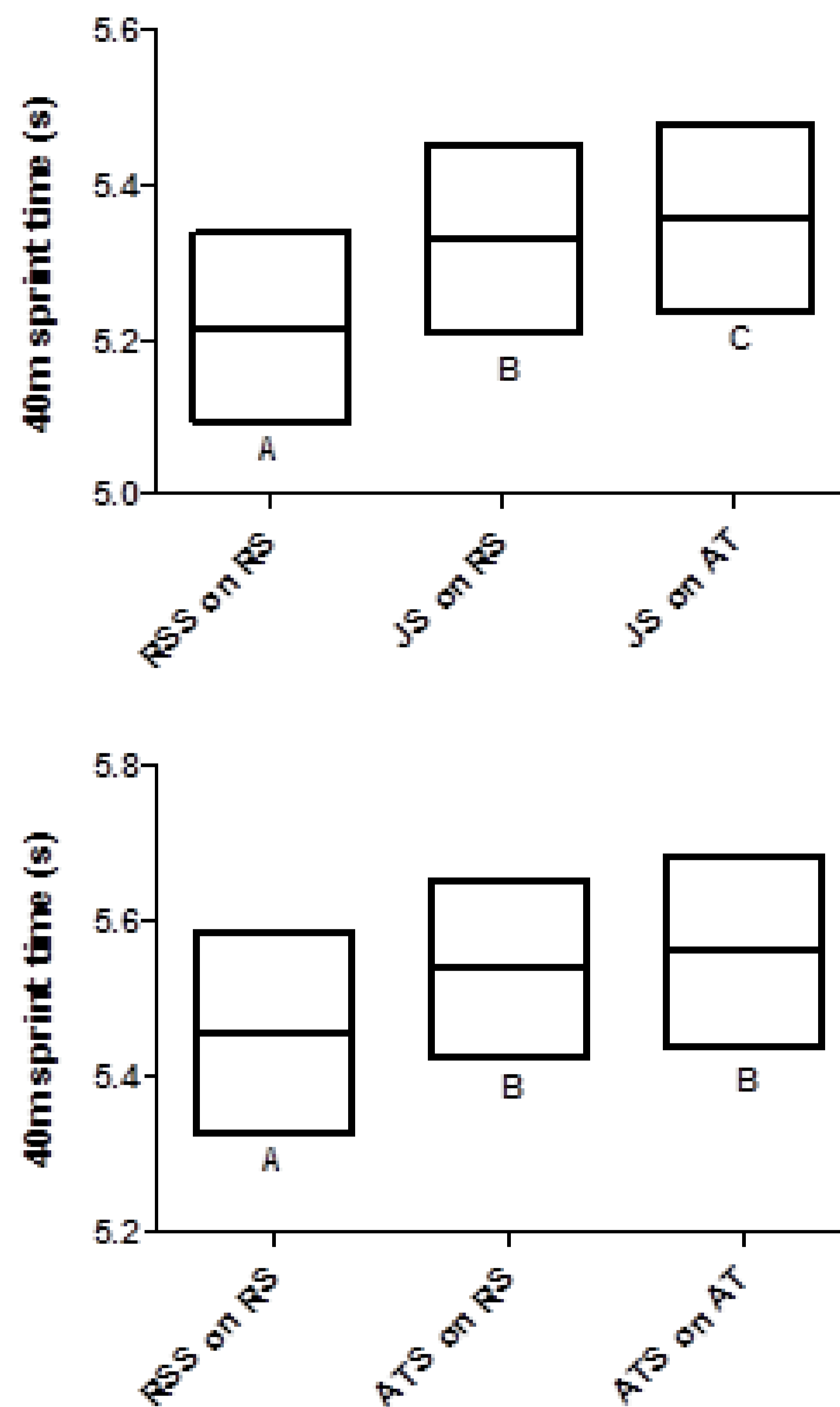


Figure 1: 95% CIs for 40m sprint time for track & field athletes (upper panel) and soccer players (lower panel) across the analyzed sprinting conditions. RSS= running spike shoes, JS= jogging shoes, ATS= artificial turf shoes, RS= rubberized surface, AT= artificial turf. Differing letters indicate significant differences among conditions.

Results

Running spike shoes yielded 0.11 s faster 40-m times for track & field athletes (2.1%; $p < 0.001$; small effect) compared to jogging shoes when sprinting on rubberized surface. The soccer players achieved 0.08 s faster 40-m times with spike shoes (1.7%; $p < 0.001$; small effect) compared to artificial turf shoes when running on rubberized surface. The differences in sprinting times were equally distributed between 0-20m and 20-40m. Rubberized surface yielded 0.02-0.03s faster 40-m times compared to artificial turf (when running with jogging shoes (track & field athletes) or artificial turf shoes (soccer players)). The impact of floor surface was significant for the track & field athletes (0.6%; $p = 0.008$; trivial effect), but not for the soccer players (0.4%; trivial effect).

Discussion

This study has shown that footwear and running surface used can combine to generate mean group 40-m sprint time differences in the range 0.1-0.15s. Running with spike shoes yield ~0.05s better times for each 20m interval sprinted, and this impact occurs regardless of spike shoe familiarization. The presented effect magnitudes are larger than most typical gains made from short-term sprint training interventions, or even the difference between superior and mediocre sprinters. For internal comparisons of performance in a training monitoring setting, changing footwear or running surface is unacceptable.

