

Abstract

The Effect of Dehydration on Vertical Jump, Muscle Strength and Sprint Performance [†]

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Abstract: **AIM:** Negative fluid balance before competition is used by some track-and-field athletes aiming to reduce body weight and increase jumping performance. However, the effects of body weight loss due to dehydration on fast and explosive muscle actions have not been fully explored. The purpose of this study was to investigate the effect of dehydration on weight-bearing and non-weight-bearing explosive movements. **MATERIAL & METHOD:** Nine athletes took part in this study (5 females and 4 males, 20–23 years old). Participants were familiarized with the procedures and measurements of the study, recorded their normal dietary and fluid intake for 3 days, and took part in two randomly assigned conditions. On one condition, carbohydrate intake was reduced by 70% and water intake by 50% of their habitual diet on the day preceding the measurements (dehydration). On the other condition, the habitual diet and fluid intake were followed (habitual hydration). Prior to the performance measurements in each condition, body weight (BW) and urine specific gravity were measured. After a standardized 15-min warm-up, the following assessments were performed: countermovement jump (CMJ), maximum isometric leg press force, and rate of force development (RFD), 10-, 20-, and 30-m sprint performance, and six 30-m sprints interspersed with 25 s of rest. **RESULTS:** Mild dehydration ($1.1 \pm 1.1\%$ BW) was achieved, which was confirmed by almost two-fold higher thirst ratings compared with habitual hydration ($p < 0.002$) and a trend for higher urine specific gravity (habitual hydration: 1025 ± 5 vs. dehydration: 1032 ± 7 mg/mL, $p = 0.054$). CMJ performance, expressed as relative power, was similar in habitual hydration and dehydration (38.5 ± 4.6 vs. 39.0 ± 3.6 W/kg BW, $p = 0.14$). Also, 20-m, 30-m, and repeated-sprint performance were similar in the two conditions, but 10-m sprint performance was impaired by $3.2 \pm 0.13\%$ ($p = 0.019$) in dehydration. Moreover, although maximum isometric leg press force was unaffected, RFD was lower in dehydration at 0–150 ms (by 13.3%; $p = 0.05$), 0–200 ms (by 11.8%; $p = 0.03$), and 0–250 ms (by 11.2%; $p = 0.03$). **CONCLUSION:** Mild dehydration did not affect maximum force or power output, but decreased acceleration and RFD. The decreases in RFD may be linked with the lower acceleration ability in these athletes.

Keywords: dehydration; muscle strength; sprint performance; vertical jump



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