

Abstract

Title: Effect of cold water immersion on intermittent isometric forearm flexor contractions to failure in rock climbers

Objectives: The aim of this study was to determine the effect of cold water immersion on intermittent isometric forearm flexor contraction to failure in rock climbers.

Methods: Thirty-two climbers (15 male and 17 female) completed three intermittent trials to failure, on a climbing-specific handgrip dynamometer, on three separate visits to the laboratory. For each visit a different recovery strategy was employed: passive recovery (PAS), cold water immersion at 8 °C (CWI 8) or 15 °C (CWI 15). The force time integral (FTI - time of contraction multiplied by the force of contraction) was determined to assess intermittent performance. The tissue saturation index (TSI) and total haemoglobin (tHb) during isometric contractions from near-infrared spectroscopy (NIRS) were determined to assess hemodynamic changes. Differences between repeated trials and three recovery protocols, derived parameters NIRS, were assessed using repeated measures ANOVA with Bonferroni corrections.

Results: There was no significant difference between conditions after trial one. In response to the PAS recovery condition there was a 10% and 22% decrease in FTI in the second and third trials, respectively. The PAS recovery strategy FTI values were lower than both CWI conditions for trials two and three ($P < 0.05$). FTI increased in the second trial ($\uparrow 32\%$ and $\uparrow 38\%$; $P < 0.05$) for both immersion conditions (CWI 8 and CWI 15 respectively) when compared with trial one. During the third trial FTI was significantly higher for CWI 15 than CWI 8 ($\uparrow 27\%$ and $\downarrow 4\%$ with respect to baseline trial; $P < 0.05$). There were no significant differences in TSI and tHb during repeated trials with PAS. A significant decrease in TSI ($P < 0.05$) was found during second and third trials with CWI compared with trial one. There were no significant differences in TSI and tHb during recovery strategies.

Conclusion: Our results suggest CWI has potential performance advantages over PAS for intermittent isometric performance to failure. The increase in performance after CWI was likely related to higher de-oxygenation of muscle tissue during isometric contractions and thus better utilisation of oxygen in capillaries.

Keywords: isometric contractions, handgrip exercise, sport climbing, recovery, cold water immersion, near-infrared spectroscopy