

Abstract

Title: Critical force of finger flexors in sport climbers

Targets: The aim of this study is to assess the validity of a graded test for determining critical strength of finger flexors and climbing performance in sport climbers.

Methods: The research sample consisted of 26 participants, including 8 women and 18 men (age 28.3 ± 7.6 years, body weight 70.8 ± 10.5 kg, height 174.6 ± 6.9 cm, climbing experience 10.4 ± 5.1 years). Two tests were conducted over two visits: a 4-minute all-out test and a graded test. Tissue saturation index (TSI), oxy[heme], and deoxy[heme] were recorded using NIRS Portamon on the flexor digitorum profundus. The diagnosis of the critical force (CF) threshold of the graded test was based on TSI, oxy[heme], and deoxy[heme] values.

Results: The CF from the graded test was on average lower (8.4 ± 3.2 kg) compared to the measured CF from the all-out test (20.6 ± 6.1 kg). The correlation of CF as a percentage of body weight (%TH) from both tests with RP performance reached the same values ($r = 0.79$). The highest relationship with RP performance in the graded test was found in the peak maximum force (%TH) $r = 0.80$. The lowest relationship with RP performance in the graded test was found in CF (%TH) $r = 0.40$. Verification trials with one participant indicated that CF might be at the level determined by the graded test.

Conclusions: The results of the study demonstrated that the graded test is more suitable for determining critical force, as the all-out test significantly overestimates the metabolically steady state. Unfortunately, only one participant was involved in the verification of the results, and further validation will be required to confirm this outcome in the future. The resulting critical force correlated very well with the reported performance of the participants.

Keywords: Critical strength, sport climbing, NIRS.