

BIOMECHANICAL PROFILE OF THE MUSCLES OF THE UPPER LIMBS IN SPORT CLIMBERS

ROBERT STASZKIEWICZ^{1A}, ROBERT ROKOWSKI², MICHAIL L. MICHAILOV³,
TOMASZ RĘGWELSKI², ZBIGNIEW SZYGUŁA^{1B}

¹*University of Physical Education in Krakow, Faculty of Physical Education and Sports, Department of Biomechanics^a, Department of Sports Medicine and Human Nutrition^b, Krakow, Poland*

²*University of Physical Education in Krakow, Faculty of Tourism and Recreation, Department of Alpinism and Tourism, Krakow, Poland*

³*National Sports Academy, Department of Theory and Methodology of Sports Training, Sofia, Bulgaria*

Mailing address: Robert Staszkiwicz, University of Physical Education in Krakow, Faculty of Physical Education and Sports, 78 Jana Pawła II Ave., 31-571 Kraków, tel.: +48 12 6831539, fax: +48 12 6831121, e-mail: robert.staszkiwicz@gmail.com, robert.staszkiwicz@awf.krakow.pl

Abstract

Introduction. Studies have demonstrated an important role of muscle strength and endurance in climbing. However, little research has explored the speed parameters of the muscles of climbers. This study aimed to evaluate biomechanical indices of the functional status of the upper limbs in climbers. **Material and methods.** Group G1 (n = 3) were athletes who were able to climb 8c+/9a climbing routes using the red-point style and 7c+/8b routes with the on-sight style. Group G2 (n = 5) comprised climbers who were able to climb 8a/8b+ and 7b+/8a routes, respectively. Maximum muscle torques were measured in the elbow and arm flexors and extensors. Hand grip tests, dynamometric arm strength tests, and laboratory endurance tests were conducted. **Results.** Strength parameters in both joints were similar in the two groups of climbers. Maximum absolute values of hand grip, crimp grip, and global arm force in hanging did not differ between the groups. Furthermore, significant differences were found for relative indices (from circa 3% to circa 12%). No significant differences were recorded for the parameters of muscle speed. Furthermore, no significant effect of the subjects' skill level on the results of endurance tests was found. The results obtained in the groups of athletes (G1, G2, and G1+2) were compared with the values recorded in a control group of students (GC, n = 48). **Conclusions.** Elite climbers were found to have an advantage over the controls only in strength and muscular endurance. No significant differences were observed in the results of speed tests in the muscles of the athletes and students examined in the study. The climbers (G1 and G2) differed in the strength potential of their muscles, but only when relative force indices were analysed. No differences were found in the biomechanical variables of speed and muscular endurance. Conventional tests are typically not a valuable diagnostic tool for the evaluation of climbers.

Key words: biomechanics, elite rock climbers, muscle strength, speed, endurance