

Explorative Study on Muscle Strength and Muscle Strength Ratios in Top National and International Badminton Players

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Introduction

Badminton is a type of sport that is characterized by unilateral and bilateral physical load. The extent to which muscular imbalances are reflected in competitive badminton has been analyzed only in the context of shoulder rotation. Despite the fact that the entire body is used, badminton-specific studies have not been published concerning the lower extremity, trunk, cervical spine, and arms. Therefore, this study's objective is to obtain an overview of the muscular strength ratios and the strength values of the key badminton-specific muscle groups.

Methods

For this study, 53 (male n = 31, female n = 22) top national and international badminton players were examined regarding isometric maximum strengths (MVC) of the knee, hip, trunk, shoulder, arm, and cervical spine. The measurements took place between June 2012 and December 2014 during the semi-annual sports medicine examinations at the Olympic Training Centre Rhineland-Palatinate/Saarland, Germany. The isometric maximum strength measurement was performed using the Diers Myoline Professional device for a defined angular position. The mean value calculations of dominant and non-dominant side and the agonist and antagonist were analyzed applying the T-test and Wilcoxon test; relationships between strengths and smash speed and maximum jump height were determined using the Pearson correlation coefficient.

Results

Comparing dominant and non-dominant side, significant strength differences were identified for flexing the knee joint ($P < 0.001$) and the elbow joint ($P < 0.033$). Comparing agonist and antagonist, significant differences were identified for the ratios between knee extension and flexion ($P < 0.000$), as well as for arm extension and flexion (dominant and non-dominant side $P < 0.001$ each). Also, the extension ratios of trunk and neck musculature were significantly greater than the flexion ratios ($P < 0.000$). High degrees of correlation existed between various strength values and maximum smash speed and maximum jump height.

Discussion

A muscle's maximum strength depends on multiple factors. With the measuring device tested by us, measurements were taken in only one angular position, which has a decisive influence on strength. Strength values can also be influenced by lever arms. The measurements were all taken in a sitting position. First reference values exist, which will be used for further assessing strength values and help plan and control badminton-specific strength training.

Conclusion

In this study, muscular differences were shown between the two sides in the arm and leg musculature of competitive badminton players. Differences in knee and elbow flexion for the two sides were particularly obvious. The maximum strength ratios of agonist to antagonist of the athletes tested are mostly congruent with the results of other, related disciplines. Therefore, no essential sports type based differences seem to exist. However, the trunk musculature is of emphasized significance.