

Neuromuscular Profile of Elite Male and Female Judokas with Assessment using Tensiomyography



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Introduction

Arms muscles strength is considered to be an important factor of performance in Judo, supporting specific motor skills and actions. The efficient coordination of agonist and antagonist muscles is one of the important early adaptations in resistance training responsible for large increases in strength (Baker & Newton, 2004, 2005; Robbins et al., 2010).

The aim of this study is: (1) Assess the contractile properties of the Biceps Brachii, Triceps Brachii, Pectorals Major and Latissimus Dorsi of elite men and women judokas; (2) Lateral symmetry Male and Female; (3) Reach the balance agonist/antagonist of arms; and (4) Analyze the association between contractile properties of the Biceps Brachii, Latissimus Dorsi with Bench Row and Triceps Brachii, Pectorals Major with the performance of strength in Bench Press in a test of progressive charges.

Methods

Twenty-eight volunteers participated in this study, divided into two groups: ten elite women judokas (WJ), eighteen men judokas (MJ), (age: 21.6 ± 3.3 vs. 20.4 ± 5.2 years; height: 1.60 ± 0.02 vs. 1.75 ± 0.05 m; body mass: 60.5 ± 9.3 vs. 76.7 ± 13.1 kg) have been assessed through tensiomyography (TMG). The maximal displacement (Dm), delay time (Td), contraction time (Tc), sustained time (Ts), and half-relaxation time (Tr) were obtained in both side of each muscle in all subjects. Reliability of the TMG assessment was tested by means of the calculating intraclass correlation coefficient reliabilities (ICCRs), and almost the values obtained were over 0.8. A t-test ($p \leq 0.05$) and Cohen's d effect sizes were implemented, and we turned to the algorithm of TMG-BMC tensiomyography[®] to determine the lateral symmetry percentages.

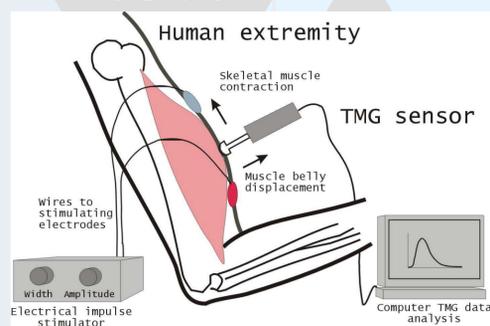


Figure 1. Assessment using Tensiomyography

In order to displacement of muscle belly, a digital displacement transducer was employed (GK 30, Panoptik d.o.o., Ljubljana, Slovenia), by placing it perpendicularly to the thickest part of the muscle belly.

Results

The results show that, WJ and MJ differ only more Time contracting their Biceps Brachial right us (29.9 ± 6.9 vs. 24.2 ± 3.5 s; $p = 0.032$), more Td (23.1 ± 1.9 vs. 21.3 ± 1.6 s; $p = 0.027$), and less percentage of lateral symmetry (83.2 ± 6.6 vs. 89.7 ± 5.8 %; $p = 0.018$). If the Tc decreasing and the Dm increasing involve a good response following the muscle training. In Latissimus Dorsi left (L) and right (R), the maximal displacement (Dm) present lower results in WJ than MJ (left, 4.2 ± 3.2 vs. 7.5 ± 3.4 mm; $p = 0.016$, right, 3.4 ± 2.8 vs. 7.3 ± 3.5 mm; $p = 0.004$).

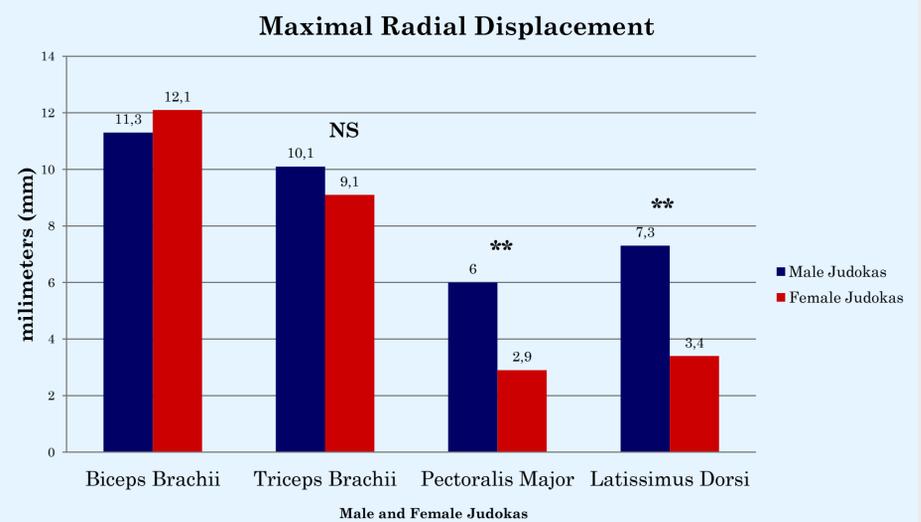


Figure 2. Maximal radial displacement of the muscles belly between male and female judokas

The lateral PM symmetry is similar between WJ and MJ (83.7 ± 7.5 vs. 82.5 ± 10.4 %; $p = 0.727$). The WJ show lower sustained time (Ts) than the MJ in the R and L Triceps Brachial (88.7 ± 42.5 vs. 155.7 ± 56.7 ms; $p = 0.002$, 83.4 ± 58.8 vs. 169.4 ± 68.8 ms; $p = 0.002$).

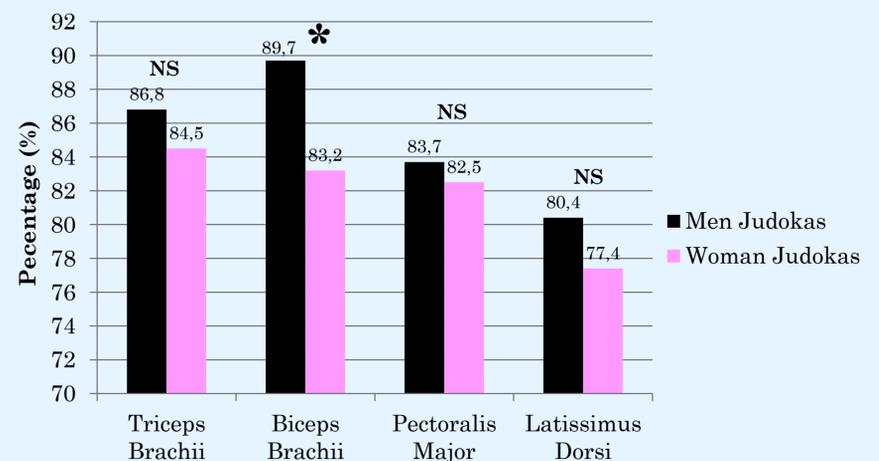


Figure 3. Symmetry right vs. left of the muscles between male and female judokas

This assessment method supports the presence of a muscle training program focused: (1) in balance of the right and the left side; (2) in balance of Agonist/Antagonist and; (3) on the muscle fibers potential to convert from one type to another, under the circumstances of a specific muscle training program.

Conclusions

In conclusion, the measurement of muscle contraction parameters, following an electric stimulation of the muscle group, enables us to adjust the muscle training to the effort intensity and the some association between these parameters with the strength.

We have been established reference values of the main muscles implied in Pull/Push Actions of elite level men and women Judokas, that could serve as a reference for coaches to carry out a neuromuscular and of the lateral symmetry monitoring of their using a technique portable, non-invasive and does not cause fatigue as with stress testing, so it does not alter the periodization of training.

References

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