

ELECTROMIOGRAPHIC ACTIVITY ALTERATIONS DURING ISOMETRIC ACTIONS PERFORMED IN WATER AND ON DRY LAND

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INTRODUCTION

Investigations in literature demonstrate lower neuromuscular responses in aquatic environment for different situations and muscle group in dynamic (Masumoto et al., 2004; Miyoshi et al., 2004) or isometric (Fujisawa et al., 1998; Pöyhönen et al., 1999) exercises.

However, recently the approaches of Rainoldi et al. (2004) and Veneziano et al. (2006) have shown that these responses may be similar between the environments if factors were controlled, such as protocol's type, skin temperature and adoption of the waterproof adhesive protection.

The objective of the present study was to verify the recording electromyographic (EMG) signal alterations of the vastus lateralis (VL) muscle during isometric actions performed in water and on land.

METHODS

The study sample consisted of eight young women (23.13 ± 1.13 years), experienced in water exercises.

Electrodes were placed on the belly of VL muscle, with a 3-cm center-to-center spacing. The EMG signals were registered with a 4-channel EMG system (Miotool400 USB, Brazil), with a common mode rejection ratio >110 dB and a sampling rate of 2000 Hz by channel. The

filtering of the raw EMG was performed with a filter Butterworth type, with a bandwidth of 25–500 Hz.

The subjects performed maximal voluntary isometric actions (MVIC) in an isokinetic dynamometer (Cybex Norm, USA) to record the peak torque for knee extensors (90° flexion knee) with (WITH) and without (WITHOUT) superficial electrodes isolations to verify the influence of the water-resistant adhesive taping (TEGADERM, 3M). Subsequently, another MVIC was performed, with the subjects seated, against manual resistance for the same EMG recordings with isolation on land (D) and in water (W) immersion up to navel to verify the influence of the environment. The root mean square (rms) values were used to analyses.

Paired T-Test and Pearson correlation were used to statistical analyses. The significance level adopted was $p < 0.05$ (SPSS vs 13.0).

RESULTS AND DISCUSSION

No statistical difference was found between VL rmsEMG values for WITH (0.560 ± 0.118 mV) and WITHOUT (0.538 ± 0.110 mV) isolation situations ($p = 0.306$), for similar peak torque values ($p = 0.191$). In addition, rmsEMG and peak torque values showed high and significantly correlation between with and without isolation situations (Figure 1).

The same results were found comparing the rmsEMG values for VL muscle between D (0.428 ± 0.054 mV) and W (0.388 ± 0.105 mV) situations ($p = 0.446$).

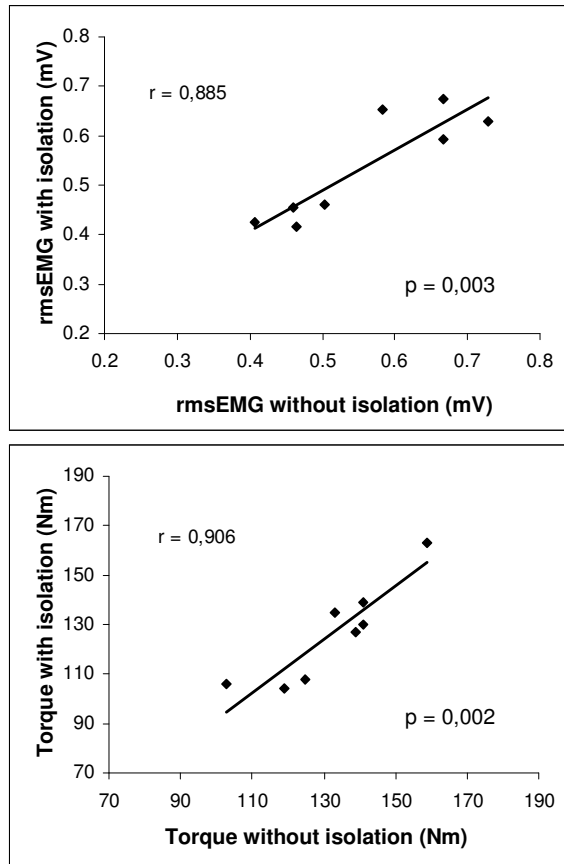


Figure 1 – Correlation for rmsEMG and peak torque values between with and without isolation situations.

The water-resistant adhesive taping did not alterate the signal EMG registered. Based in this finding, we found no differences on rmsEMG values during isometric action performed both in water and on land, suggesting that the environment did not influence the rmsEMG amplitude. Our data corroborate with similar studies (Rainoldi et al., 2004; Veneziano et al., 2006) that stated the use of the isolation to register EMG signal in water.

SUMMARY

Thus, this methodology suggests that future EMG signal comparisons might be employed with the subjects in different environments.

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