ELECTROMYOGRAPHY DURING AQUATIC CYCLING IN DIFFERENT CADENCES: PILOT STUDY

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INTRODUCTION: The effects of cadence and load on lower limb muscles activities using electromyography (EMG) are well documented in cycling literature (Baum and Li, 2003). They reported that increase of cadence displayed a non significant reduction of the EMG for Biceps Femoris (BF) and Vastus Lateralis (VL); however, with an increased load there was an increase in the EMG in both muscles when used Monarch cycle ergometer. They attributed this reduction of the EMG in relation to cadence to increase of inertial influence on pedal force. The aim of this study is to verify influence of cadences (50 and 65rpm) on lower limb muscles activities (BF and VL) using aquatic cycle ergometry (ACE).

METHOD: Four healthy males of mean (±SD); 21,7(±1,8) years; 1,70(±0,03)m; 63(±8,4)kg and 22(±2,4)kg/m^2. They performed pattern movement cycling on ACE (Water Bike®) for 2min in each cadence (50 and 60rpm) and 3 trial maximum isometric voluntary contractions (MIVC) of flexion-extension of 90º knee angle with 5min of rest between the trials. In all procedures, the EMG on muscles VL and BF was recorded (MyoTrack 3), following the recommendations of the European Recommendations for Surface ElectroMyoGraphy. The electrodes were waterproof with adhesive tape (Tegaderm 3M). To analyze the EMG signal, the mean of register was used in all the procedures and the values expressed as a percentage of the MIVC EMG signal. Statistical Analysis was used to calculate the means, SD, and the Wilcoxon pairs test to verify the difference between the cadences (p<0.05).

RESULTS: Table 1 shows the signal mean value and ±SD of the muscles EMG (mV) in different cadences on ACE, MIVC and percentage of MIVC. It shows that with a change on the cadence there was an increase: 3,34% EMG to BF (p=0.11) and 10,24% to VL (p=0.28).

Table 1 Signal Mean Value, SD of EMG per cycle of the cadences, MIVC and % of the MIVC.

Muscles	50rpm	65rpm	MIVC	50rpm/%MIVC	65rpm/%MIVC
BF	44,25 ±18,41	52,00 ±18,11	267,00 ±130	16,00	19,48
VL	65,00 ±17,60	82,00 ±37,53	166,00 ±76	39,16	49,40

DISCUSION: This study showed that the increase of the EMG with change cadence in water can be related to influences of the hydrodynamics forces, but statistically did not have significant difference. Even with water inertia, the constant angular velocity produces accommodating resistance in the movement, with isokinetic nature. The increase of drag under water has positive proportion with the cadence (Pöyhönen *et al.*, 2001).

CONCLUSION: The increase in cadence influences the level of drag under water; consequently, there is an increase of the EMG.

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