EMG ACTIVATION OF ABDOMINAL MUSCLES IN THE CRUNCH EXERCISE PERFORMED WITH DIFFERENT EXTERNAL LOADS

Moraes, A. 1, Pinto, R. 2, Valamatos, M. 3, Valamatos, M. 3, Pezarat-Correia, P. 3, Santos, P. 3, Cabri, J. 3

1Faculdade de Educação Física, UNICAMP, Brasil
2Escola de Educação Física, UFRGS, Brasil
3Faculdade de Motricidade Humana, UTL, Portugal

Introduction

Compared with the sit-up, the risk for the lumbar spine compression in the crunch is reduced [1,2], but the abdominal muscles are less activated. So, it is important to find the most effective ways to maximize abdominal activation when using the crunch for abdominal strength training.

The purpose of the present study was to compare the activation level of abdominal muscles in the first repetition of each set of crunches performed with different external loads.

Methods

13 subjects (5 females, 8 males), performed crunch exercises (knees flexed 90°, legs fixed) with no external load and with loads representing 100, 80, 60, 40 and 20% of the 1RM, with 5` rest between sets. Surface bipolar EMG electrodes were placed on muscles of both sides, except for the RF: the upper portion (RAUR and RAUL) and the lower portion of the Rectus Abdominis (RALR and RALL), the External Oblique (OER and OEL) and the Rectus Femoris (RFR). The root mean square (RMS) of the EMG was calculated for the first repetition of each load. Mean values and SD of normalized RMS were calculated. Differences between conditions were tested using the one way ANOVA for repeated measures. Post-hoc Bonferroni test was used to detect significant differences between specific loads (p < 0.05).

Results

Each subject performed the maximum number of repetitions in each percentage of the maximal external load: 20% (30±2.8), 40% (26±3.8), 60% (22±5), 80% (14±2.5). When the crunch was performed without external load (0%) the subjects only performed six repetitions.

We used an average of the percentage values of all studied abdominal muscles as a representative value of abdominal synergy (Ab Syn).

Discussion / Conclusions

Considering the Abdominal Synergy [3] as a representative measure of the abdominal muscles in general we can conclude that the abdominal muscles were significantly more recruited in the 100% repetition than in the first repetition of any other external load condition. As we can observe in the Table 2, with the exception of the 100% condition, no significant differences were found in the Abdominal Synergy between each percentage load and the percentage of the external load immediately superior and inferior.

References