

COMPARISON OF THE BRACHIAL BICEPS AND TRICEPS ACTIVATION DURING PEC DECK AND BENCH PRESS EXERCISES WITH THE VALUES OBTAINED DURING THE 1RM TEST IN THE BICEPS CURL AND TRICEPS PRESSDOWN.

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INTRODUCTION

In pec deck and bench press exercises, besides the pectoral muscle, the biceps and triceps brachial muscles also play a role in the execution of the movement. Nevertheless, in the prescription of these exercises, the load imposed on these two muscle groups is unknown, which makes it difficult to precisely identify their level of activation.

Hence, though studies exist that analyse pec deck and bench press exercises, there remains a gap in the literature concerning the quantification of the activation of certain muscles in these exercises, comparing such activation to that found in monoarticular exercises where they are primary motors of the movement.

METHODS

Fifteen (15) male individuals performed a series of three repetitions of the pec deck and bench press exercises at intensities of 20, 40, 60 and 80% of one maximum repetition (1RM). The levels of activation were evaluated using the electromyographic signal (Miotoool 400, Miotec, Brazil) from the brachial biceps and triceps muscle groups and the values obtained were compared with those found during the bicep curl and tricep curl exercises at 1RM, respectively. The comparisons were made using repeated measures variance analysis and Bonferroni's post-hoc test. ($p \leq 0.05$).

RESULTS AND DISCUSSION

The results showed an increase of the muscular activity of the brachial biceps and triceps with the increase in the exercise load (Table 1). The maximum level of activity of the brachial biceps was seen at 80% of 1RM in pec deck, attaining 28% of the maximum activation. Similarly, a maximum level of activity of the brachial triceps muscle was seen at 80% of 1RM in the bench press, attaining 44% of the maximum activation. The brachial biceps, besides acting as the primary motor in the elbow flexion movement, also aids in the shoulder joint movements. Its points of origin (coracoid process) and insertion (radial tuberosity) would suggest a role for the short portion of the muscle in the horizontal shoulder flexion (Rash, 1977). In contrast, due to its point of origin (scapula and humerus) and insertion at the extremity of the olecranon (Rash, 1977), the triceps brachial muscle, primary motor in the elbow extension movement, act dynamically during the execution of the bench press exercise. In such case, the activation of these two muscle groups was expected, since the biceps and triceps brachial act as synergists in the pec deck and bench press exercises, respectively.

Furthermore, we observed a non-linear increase in muscular activity with the increment in the load used. These findings are in line with those reported in other studies (De Luca et al., 1982; De Luca,

1985; De Luca, 1997), where the non-linearity of the force/electromyographic signal curve was demonstrated in some muscles. This lack of a quantitative relationship between the two factors impedes us from knowing at what percentage of maximum force the muscle is working during the performance of the exercises at a determined intensity. However, there is, in fact, a qualitative relationship between the force generated by a muscle and the level of electromyographic activity (De Luca et al., 1982; De Luca, 1985; De Luca, 1997; Naito et al., 1998). Accordingly, in the present study, the increases in the electromyographic activity seen with the increase in the intensity of the exercises indicate an increase in the production of force generated by the analysed muscles, though the magnitude of this increase in force cannot be described.

CONCLUSIONS

Our findings suggest that in the pec deck and bench press exercises the brachial biceps and triceps muscles act constantly during the performance of the exercise and increase their activity as the exercise load is increased, and may reach levels of up to 44% of maximum.

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Table 1: Means and Standard deviations of EMG values in Peck deck and bench press exercises, normalized by EMG values obtained in biceps curl and triceps pressdown, respectively.

	20%	40%	60%	80%
Biceps (% max)	7.9 ± 3.6	17.6 ± 6.9	26.9 ± 12.0	44.0 ± 16.2
Triceps (% max)	3.1 ± 1.1	6.5 ± 2.8	12.7 ± 6.5	28.6 ± 16.1