ANALYSIS OF THE ROM, PASSIVE TORQUE, STIFFNESS AND WORK ABSORPTION AFTER CONCENTRIC AND ECCENTRIC MUSCLE ACTIONS

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KEY WORDS: flexibility parameters, concentric and eccentric training.

INTRODUCTION: Muscular strength and flexibility are two important physical capacities that are frequently assessed and trained in athletes before and during sporting competitions (Nobrega et al. 2005), but their interactions are not well established. The purpose of this study was to determine the acute effects of concentric and eccentric contractions on the range of motion (ROM), passive peak torque (PPT), stiffness and work absorption.

METHOD: Twenty-three male volunteers participated in this study and were randomly divided, in 2 groups: concentric (CG, n=12), eccentric (EG, n=11). The exercise bout consisted of 3 series of 12 repetitions at 70% of one repetition maximum (1RM) for CG (only concentric contractions) and EG (only eccentric contractions) and was carried out on a seated leg curl machine. A third group (control, n=12) was formed to verify the reliability of the investigated parameters and did not train strength. A test apparatus was built (Flexmachine) to measure the ROM, PPT, stiffness and work absorption. This instrument consists of a mechanical arm connected parallel to a chair that extends the knee joint passively (5°/s) in the sagital plan. To measure the flexibility parameters, a strain gauge was mounted on the mechanical arm and a potentiometer was fixed on the axis of rotation of the arm. Changes with exercise bouts (pre x post) were analysed using Student`s paired *t*-test.

RESULTS: The results are presented in the table 1. The ICC values for ROM, PPT, stiffness and work absorption were 0.98, 0.98, 0.97 and 0.95, respectively.

Table 1 – Flexibility parameters for CG and EG. Values are mean ± SD.

	ROM (º)		PPT (N.m)		Stiffness (N.m/º)		Work absorption (N.m.s)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
EG	92,1±10,5	94,88±10,6*	81,9±18,5	86,1±17,9*	0,9±0,4	0,9±0,3	1261,0±670,0	1297,3±686,2
CG	89,4±8,8	90,0±11,0	77,6±17,0	77,7±16,7	1,0±0,3	1,0±0,4	1195,2±561,8	1164,4±545

* Post significantly different from pre exercise bout, $P< 0,05$.

DISCUSSION: The results did not demonstrate acute viscoelastics alterations after one concentric or eccentric exercise bout. The eccentric contractions had probably increased the maximum stretch tolerance provoked by acute accommodation of the muscle nociceptors, altering the sensibility of the pain and enabling the subjects to tolerate more tension, which was registered in the PPT. With a higher torque, the knee joint could be moved in a higher ROM, explaining the positive improvement of the ROM.

CONCLUSION: The results suggest that one bout of eccentric exercise is able to increase the passive peak torque of the hamstrings muscles, allowing a higher ROM achieve.

REFERENCE:

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