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DOES ELECTRICAL STIMULATION OF KNEE EXTENSOR AND FLEXOR MUSCLES INDUCE DOMS?

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Introduction: Neuromuscular electrical stimulations (NMES) are frequently used to improve muscle performance. It has been shown that the gains observed at the end of a NMES program depend on the intensity of the contractions that are electrically evoked during the training sessions. Therefore, it is suggested to prompt subjects to tolerate the highest current intensity as possible. The present work aimed to study the effect of an intense NMES session on muscle soreness and tightness.

Methods

Ten physically active men (24 ± 3 years, 181 ± 4 cm, 74 ± 11 Kg) underwent unilaterally, isometrically and consecutively 20 min of quadriceps (Q) and 20 min of hamstrings (H) NMES. The stimulator provided biphasic rectangular pulses (80 Hz, duration 0.35 ms, on-off ratio 6-6 s) and the current intensity was continually increased throughout the session at maximal tolerable level (~ 75 mA at the end of both bouts). Torque measurements were performed using an isokinetic dynamometer (Biodex3). Subjective perception of muscle soreness was evaluated by the Visual Analogue Scale (0-10 a.u.). Flexibility of the Q was tested with the prone quadriceps flexibility test (distance between heel and buttock with the knee maximally flexed) and the H flexibility was tested with the straight leg raising test (hip angle). Creatine kinase (CK) activity was measured from blood sampling. All parameters were evaluated before as well as 24 h (d1) and 48 h (d2) after the NMES provocation bout.

Results: During the NMES bout, the stimulated contractions reached, in mean, 31% and 19% of maximal voluntary torque (MVT) for the Q and the H, respectively. All measured variables were significantly modified after the electrostimulated exercise. The highest variations occurred at d2 (mean VAS scores = 3.15 ± 1.83 a.u.; mean reductions in Q flexibility = +3.2 cm; mean reductions in H flexibility = –13°; mean CK activity = 3021 ± 2693 IU/l).

Discussion: Generally, DOMS occur in skeletal muscle after strenuous exercise, especially when high peak forces are involved during eccentric contractions (Croisier et al., 2003). In the present study, we showed that one session including NMES of quadriceps and hamstrings muscles, realized isometrically and inducing sub-maximal contractions (~ 20-30% MVT), provokes muscle soreness and stiffness and increased CK activities suggesting the occurrence of DOMS. Those DOMS could be induced by the specificities of NMES i.e. temporal and spatial recruitment (Vanderthommen and Duchateau, 2007). The fact that a NMES session, realized in conditions close to the field conditions of training or rehabilitation in terms of stimulation parameters, electrodes positioning and intensity adjustment, can induce an alteration in muscle function constitutes a relevant information.

References

Croisier JL, Camus G, Forthomme B, Maquet D, Vanderthommen M and Crielaard JM. (2003). Isokinetics Exerc Sci, 11, 21-29.

Vanderthommen M, Duchateau J. (2007). Exerc Sport Sci Rev, 35, 180-185.

PROFILING ANTHROPOMETRIC AND ISOKINETIC STRENGTH CHARACTERISTICS IN 14-15 YEARS OLD BASKETBALL PLAYERS.

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Explosive muscle strength and muscular balance of the knee joint are important parameters to succeed in basketball. Isokinetic testing has been consistently used for assessment of concentric and eccentric strength of the knee joint musculature. The literature is more abundant for soccer players (Sangnier & Tourny-Chollet, J Strength Cond Res, 22: 2008) than for other team sports, in general, and basketball, in particular. In addition, isokinetic assessment has not been systematically considered in adolescent basketball players taking into account growth characteristics. The present study examines the isokinetic parameters of the knee joint musculature in 14-to 15-year-old basketball players by playing position.

A total of 51 basketball players (14.0-15.9 yrs; 2-11 years of training) were categorized as guards (n=16), forwards (n=21), and centers (n=14). Anthropometry included those measurements needed for estimation of leg volumes (Jones & Pearson, J Physiol, 204: 1969), plus stature and body mass. After a 5-min warm-up at 60 rpm in a cycle-ergometer (Monark) and stretching, subjects performed five maximum knee extensions (KE) and flexions (KF) in the isokinetic dynamometer (Biodex system 3, Biodex Corporation, Shirley NY, USA) programmed at 60 degrees/s (modes CON and ECC in both legs. Moments were corrected for the effect of gravity and the highest moment from the five trials for each contraction mode was retained for analysis. Parameters for analysis were absolute peak torque (PT), relative peak torque (PT per kg of body mass), 'functional' and 'conventional' hamstrings to quadriceps (H/Q) ratios and bilateral differences (Aagaard et al, Am J Sports Med, 26: 1998). Analysis of variance (ANOVA) was used to test position-related variation in body size and strength parameters. Significance level was set at p≤0.05.

As expected, centers were taller ($F=12.251$; $p < 0.01$) and heavier ($F=11.021$; $p < 0.01$) than guards and forwards, whereas forwards had similar stature and body mass as guards in this age group. Results in PT showed differences, from centers to both forwards and guards, in mean ECCKF in the dominant leg ($F=3.979$; $p<0.05$). Also in the non-dominant leg differences revealed in mean ECCKF ($F=4.203$; $p<0.05$) and ECCKE ($F=4.392$; $p<0.05$). No differences were found in mean CON PT, as well as H/Q ratios and bilateral differences.

The present studies showed a significant position-related variation of body size and absolute peak torque. When expressing isokinetic strength per unit of body mass the effect of playing position was not anymore significant. Future research including maturational assessments is needed during pubertal years. It would also be of interest to investigate the effect of playing position in players accumulating more years of basketball practice. The current ongoing project will report the relationship between isokinetic outputs and concurrent anaerobic tests.

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