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Neuromuscular response and muscle oxygenation during and after 48 h. of 10x10 eccentric squat protocol

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Background: Eccentric training has been extensively reported to increase concentric, isometric and eccentric strength (Douglas, Pearson, Ross, & McGuigan, 2016), although the acute neuromuscular and physiological responses to this type of training is much less studied than traditional strength training. Many methods have been studied to analyze neuromuscular and physiological responses to strength training, such as the loss of counter movement jump (CMJ) height (Sánchez-Medina & González-Badillo, 2011) or the levels of muscle oxygenation using near infrared spectroscopy (NIRS) (Pereira, Gomes, & Bhambhani, 2007). However, the recording of acute response in muscle oxygenation and CMJ during and after eccentric training has not been reported yet, and its study could have scientific interest and direct practical applications because it could help monitoring load and fatigue.

Objective: To analyze the acute effects of a single bout of the squat exercise performed with an eccentric overload (using an isoinertial device) on muscle oxygenation and CMJ height.

Methods: Thirty-eight healthy subjects (males n=32 females= 6, age 22.03±3.42 years), participated in an eccentric training session which consisted of 10 sets of 10 repetitions in the squat exercise. Two recovery minutes between sets were allowed within sets. Muscle oxygenation (using NIRS) of the vastus lateralis, CMJ height and sagittal degrees during drop jump land for hip, knee and ankle were measured. One-way analysis of variance (ANOVA) with repeated measures was used to determine differences between sets and baseline, post-sets and after 48 hours.
Results: There was a significant reduction in CMJ and sagittal degrees during drop jump land for knee values between baseline (p<0.01), post each set and after 48 hours.
Average CMJ decrease between baseline and the last set was -23.02% (p<0.01). After 48 h., CMJ height returned to baseline values.
The percentage of oxygen saturation was also significantly lower between sets, with values ranging 38.41-60.85% (p<0.01)

Conclusions: A single bout of eccentrically overloaded squats produced a significant reduction on CMJ height, although baseline values were recovered after 48h. Also, muscle oxygenation kinetics showed significant changes after each set. CMJ and muscle oxygen saturation of vastus lateralis could be good indicators of fatigue during and after eccentric training.

Practical application: Monitoring the fatigue produced by eccentric training using the CMJ and muscle oxygenation could be of great interest for strength and conditioning coaches who wish to optimize training and manage recovery.

References:

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