

Neuromuscular Responses during Knee Extension Exercise in Combination with Different Blood Flow Restriction Initial Pressures

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Category: Masters

ABSTRACT

Specifications of blood flow restriction training technique have been widely discussed to create a valid and reliable protocol. One of the unexplored variables is the effect of different initial restrictive pressures (tightness of cuffs, IRP) in combination with resistance exercise on neuromuscular responses and strength.

PURPOSE: The purpose of this study was to determine any differences in amplitude (RMS) and median frequency (MDF) of electromyography (EMG) signals, as well as changes in strength during knee extension exercises with IRPs of 40-45 mmHg and 60-65 mmHg. **METHODS:** Twenty male subjects (age = 25.7 ± 4.3 yrs), participated in this study. They were required to attend the lab on 3 different occasions, with the first one being a familiarization session. On the subsequent sessions, participant's upper leg was measured starting from the lateral epicondyle to the greater trochanter of the femur. An EMG electrode was placed at one-third the distance over the longitudinal axis of the vastus lateralis (VL) after shaving, abrading and cleaning with isopropyl alcohol. Initial restrictive pressure was randomly selected and participants completed a pre-exercise maximum voluntary contraction (MVC) test to determine their torque. For dynamic exercises, load was set at 20% MVC and each participant performed one set of 30 repetitions and three sets of 15 repetitions, separated by one minute rest. Post-exercise MVC was performed to assess the changes in leg strength following exercises. **RESULTS:** Results showed significant main effects ($p < 0.01$) in leg strength for condition (40-45 mmHg vs. 60-65 mmHg) and trial (pre vs. post MVC). A significant main effect was observed for condition for MVC EMG amplitude ($p < 0.01$). In addition, there were significant main effects for contractions ($p < 0.01$) in both EMG amplitude and MDF during dynamic exercises. **CONCLUSION:** The significant decreases in knee extension strength at IRP of 60-65 mmHg compared to IRP of 40-45mmHg from pre- to post-exercise suggest that subjects experienced more fatigue at 60-65 mmHg because of the decreased availability of oxygen to the working muscle. The use of different IRP will affect the level of blood flow and oxygen supply to skeletal muscle possibly causing variation in neuromuscular adaptation due to changes in total and type of muscle fiber recruitment.