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Electromyographic activity and applied load during seated quadriceps exercises.

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PURPOSE: The aim of this study was to quantify and compare mean quadriceps muscle activity and applied load for eight seated quadriceps exercises using four types of resistance. METHODS: Using surface electromyography (EMG), the right rectus femoris (RF), vastus lateralis (VL), and vastus medialis oblique (VMO) muscles of 52 university students aged 23.5 +/- 3.4 yr (35 female and 17 male subjects) were examined during the exercises. Resistance devices included an ankle weight (78 N), blue Thera-Band tubing, a Cybex 340 isokinetic dynamometer, and an Inertial Exercise Trainer (IET). Electrogoniometer data were collected to determine the range of motion (ROM), angular velocity, and phase (concentric/eccentric) of exercise. Load cell data were analyzed to determine tubing and IET applied loads during exercise. A within-subjects criterion was used to improve intrasubject EMG reliability. All EMG values were normalized to a 100% maximum voluntary isometric contraction. Repeated measures ANOVAs with Bonferroni comparisons were used for statistical analysis. RESULTS: Within-subject effects of muscle and exercise were significant ($P < 0.05$) for both the concentric and eccentric muscle activity. The interaction effect of mean average EMG amplitude across exercises for the concentric phases of knee extension was significant ($P = 0.001$). No significant interactions were found for the eccentric phases of all seated quadriceps exercises. None of the exercises selectively isolated the VMO over the VL; however, the VMO/VL ratio was less ($P < 0.05$) during the concentric phases of the free weight and elastic tubing exercise when compared with the others. Eccentric phase VMO/VL ratios revealed that inertial resistance elicited greater muscle activity than other forms of resistance exercise. CONCLUSION: These findings suggest clinicians should consider biomechanical and resistance data when developing a strengthening program for the quadriceps muscle. Some seated quadriceps exercises may be more appropriate for certain rehabilitation goals than others.

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