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Muscle force and activation under stable and unstable conditions.

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Abstract

The objective of this study was to determine differences in isometric force output, muscle activation (interpolated twitch technique), and electromyographic activity of the quadriceps, plantar flexors (PF), and their antagonists under stable and unstable conditions. Instability in subjects was introduced by making them perform contractions while seated on a "Swiss ball." Eight male subjects performed unilateral leg extensor (LE) and PF contractions while seated on a bench (LE), chair (PF), or a ball. Unstable LE and PF forces were 70.5 and 20.2% less than their stable counterparts, respectively. Unstable quadriceps and PF activation averaged 44.3 and 2.9% less than activation under stable conditions. Unstable antagonist/agonist ratios were 40.2 and 30.7% greater than stable ratios in the LE and PF protocols, respectively. The greater decrements with LE can be attributed to the instability of only 2 points of floor contact, rather than 3 points of floor contact as with the PF. Swiss balls may permit a strength training adaptation of the limbs, if instability is moderate, allowing the production of overload forces.
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