Comparison between voluntary and stimulated contractions of the quadriceps femoris for growth hormone response and muscle damage.

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This study aimed to compare voluntary and stimulated exercise for changes in muscle strength, growth hormone (GH), blood lactate, and markers of muscle damage. Nine healthy men had two leg press exercise bouts separated by 2 wk. In the first bout, the quadriceps muscles were stimulated by biphasic rectangular pulses (75 Hz, duration 400 μs, on-off ratio 6.25-20 s) with current amplitude being consistently increased throughout 40 contractions at maximal tolerable level. In the second bout, 40 voluntary isometric contractions were performed at the same leg press force output as the first bout. Maximal voluntary isometric strength was measured before and after the bouts, and serum GH and blood lactate concentrations were measured before, during, and after exercise. Serum creatine kinase (CK) activity and muscle soreness were assessed before, immediately after, and 24, 48, and 72 h after exercise. Maximal voluntary strength decreased significantly ($P < 0.05$) after both bouts, but the magnitude of the decrease was significantly ($P < 0.05$) greater for the stimulated contractions (-22%) compared with the voluntary contractions (- 9%). Increases in serum GH and lactate concentrations were significantly ($P < 0.05$) larger after the stimulation compared with the voluntary exercise. Increases in serum CK activity and muscle soreness were also significantly ($P < 0.05$) greater for the stimulation than voluntary exercise. It was concluded that a single bout of electrical stimulation exercise resulted in greater GH response and muscle damage than voluntary exercise.