ABSTRACT

**Background:** Inhibition of the quadriceps muscle and reduced knee-extension strength is common shortly following total knee arthroplasty (weeks to months), due to reduced voluntary activation of the quadriceps muscle. In healthy subjects, strength training with heavy loads is known to increase agonist muscle activity, especially if the exercise is conducted using rapid muscle contractions.

**Purpose:** The purpose of this study was to examine if patients with total knee arthroplasty could perform rapid knee-extensions using a 10 RM load four to eight weeks after surgery, and the degree to which rapid knee-extensions were associated with greater voluntary quadriceps muscle activity during an experimental strength training session, compared to that elicited using slow knee-extensions.

**Study Design:** A randomized cross-over study.

**Methods:** Twenty-four patients (age 66.5) 4-8 weeks post total knee arthroplasty randomly performed one set of five rapid, and one set of five slow knee-extensions with the operated leg, using a load of their 10 repetition maximum, while surface electromyography recordings were obtained from the vastus medialis and lateralis of the quadriceps muscle.

**Results:** Data from 23 of the 24 included patients were analyzed. Muscle activity was significantly higher during rapid knee-extensions (120.2% [10th-90th percentile: 98.3-149.1]) compared to slow knee-extensions (106.0% [88.8-140.8]) for the vastus lateralis (p<0.01), but not for the vastus medialis (120.8% [90.4-134.0]) and (121.8% [93.0-133.0]) (p=0.17), respectively. Slow and rapid knee-extensions were performed at a median angular velocity of 19.7 degrees/sec (13.7-24.4) and 51.4 degrees/sec (28.9-63.1), respectively.

**Conclusion:** Four to eight weeks after their total knee arthroplasty, the patients in the present study were able to conduct rapid knee-extensions according to the experimental protocol with an approximately doubled angular velocity compared to slow knee-extensions. This was associated with increased muscle activity in the vastus lateralis when compared to slow knee-extensions, but not in the vastus medialis. Whether this significant, although relatively small, difference in vastus lateralis muscle activity has any clinical relevance needs further study.

**Level of Evidence:** 3

**Keywords:** Exercise evaluation, knee-extension velocity, quadriceps muscle, rehabilitation, total knee arthroplasty

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