



## A modified neuromuscular electrical stimulation protocol for quadriceps strength training following anterior cruciate ligament reconstruction.

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### STUDY DESIGN:

Randomized clinical trial, single-masked.

### OBJECTIVES:

To determine the effectiveness of using a modified neuromuscular electrical stimulation (NMES) training program as an adjunct treatment for improving quadriceps strength and physical function in rehabilitation following anterior cruciate ligament reconstruction (ACLR).

### BACKGROUND:

NMES training for quadriceps strengthening has previously been shown to be an effective adjunct treatment following ACLR when performed against isometric resistance using a dynamometer with the knee positioned in flexion. We developed a modified version of published NMES protocol because some patients have difficulty tolerating the existing protocol and many clinics may not have instrumented dynamometers. There is a need to determine the effectiveness of this modified protocol.

### METHODS AND MEASURES:

Forty-three subjects who had undergone ACLR were randomly assigned to either a group that received (NMES group) or did not receive (comparison group) the NMES treatment in conjunction with their rehabilitation. Group means for quadriceps strength and self-reported measures of knee function were compared after 12 and 16 weeks of rehabilitation. The proportion of subjects in each group achieving clinical criteria to initiate ambulation without crutches, treadmill running, and agility training at selected times during rehabilitation were also compared.

### RESULTS:

The NMES group demonstrated moderately greater quadriceps strength at 12 weeks (effect size, 0.48), and moderately higher levels of self-reported knee function at both 12 (effect size, 0.72) and 16 (effect size, 0.65) weeks of rehabilitation compared to the comparison group. A greater proportion of subjects in the NMES group achieved clinical criteria for advancing to agility training at 16 weeks.

### CONCLUSIONS:

The modified NMES quadriceps training protocol can be a useful adjunct to ACLR rehabilitation programs, but the treatment effect is smaller than what has been reported in previous studies.  
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