

# Neuromuscular Electrical Stimulation Superimposed on Movement Early after ACL Surgery

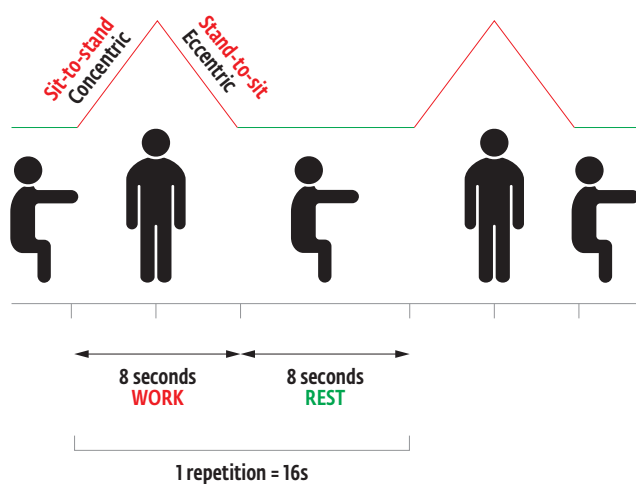
Labanca L, Rocchi JE, Laudani L, Guitaldi R, Virgulti A, Mariani PP, Macaluso A  
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## The exercise protocol explained

### NMES superimposed to sit-to-stand-to-sit exercise

- For the sit-to-stand-to-sit (STSTS) exercise the patient starts in the sitting position with 90° knee angle (60° in the first two weeks) and feet hip width apart.
- The patient moves from a sitting to a standing position and then goes back to the sitting position.
- Total duration of the STSTS movement is 8 seconds. The STSTS movement is followed by 8 seconds rest before the next repetition of the STSTS exercise starts.
- The quadriceps performs a concentric contraction during the sit-to-stand phase of the exercise, and an eccentric contraction during the stand-to-sit phase of the exercise.
- Work load is gradually increased throughout the training sessions by increasing the number of repetitions and by increasing the duration of the eccentric phase.
- Superimposed NMES means the electrical stimulation is applied simultaneously with the voluntary muscle work. Patients are encouraged to voluntarily activate their quadriceps muscle throughout the duration of the electrical stimulation.



## Chattanooga Wireless Pro NMES Protocol

<b>Electrode Placement</b>	V. medialis v. lateralis	Prox. electrode at proximal end of muscle belly; distal electrode at distal end of muscle belly or on the motor point.
<b>Duty Cycle</b>	8 sec / 8 sec	Stimulation during STSTS, no stimulation during rest
<b>Frequency</b>	35 Hz / 50 Hz	On alternating sessions
<b>Wireless Pro Program</b>	35 Hz 50 Hz	Amyotrophy 1 Resistance 1
<b>Intensity</b>	Max tolerable	Increased by the trainer at each repetition of each session and throughout all the sessions, in accordance with patient tolerance, to maximize motor unit recruitment

## Training Schedule and Progression

<b>Start</b>	At postop day 15		
<b>Duration</b>	6 weeks		
<b>Total Sessions</b>	30 (5 sessions/week)		
<b>Progression</b>	<b>Repetitions</b>	<b>Concentric</b>	<b>Eccentric</b>
<b>Day 15-20</b>	3 sets of 6 reps	4 seconds	4 seconds
<b>Day 21-30</b>	3 sets of 10 reps	4 seconds	4 seconds
<b>Day 31-45</b>	3 sets of 10 reps	2 seconds	6 seconds
<b>Day 46-60</b>	3 sets of 12 reps	2 seconds	6 seconds

NOTE: These programs are also available on the wired portable 4-channel Chattanooga devices.

