

Neuromuscular electrical stimulation. An overview and its application in the treatment of sports injuries

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In sports medicine, neuromuscular electrical stimulation (NMES) has been used for muscle strengthening, maintenance of muscle mass and strength during prolonged periods of immobilisation, selective muscle retraining, and the control of oedema.

A wide variety of stimulators, including the burst-modulated alternating current ('Russian stimulator'), twin-spiked monophasic pulsed current and biphasic pulsed current stimulators, have been used to produce these effects. Several investigators have reported increased isometric muscle strength in both NMES-stimulated and exercise-trained healthy, young adults when compared to unexercised controls, and also no significant differences between the NMES and voluntary exercise groups. It appears that when NMES and voluntary exercise are combined there is no significant difference in muscle strength after training when compared to either NMES or voluntary exercise alone.

There is also evidence that NMES can improve functional performance in a variety of strength tasks. Two mechanisms have been suggested to explain the training effects seen with NMES. The first mechanism proposes that augmentation of muscle strength with NMES occurs in a similar manner to augmentation of muscle strength with voluntary exercise. This mechanism would require NMES strengthening protocols to follow standard strengthening protocols which call for a low number of repetitions with high external loads and a high intensity of muscle contraction. The second mechanism proposes that the muscle strengthening seen following NMES training results from a reversal of voluntary recruitment order with a selective augmentation of type II muscle fibres. Because type II fibres have a higher specific force than type I fibres, selective augmentation of type II muscle fibres will increase the overall strength of the muscle.

The use of neuromuscular electrical stimulation to prevent muscle atrophy associated with prolonged knee immobilisation following ligament reconstruction surgery or injury has been extensively studied. NMES has been shown to be effective in preventing the decreases in muscle strength, muscle mass and the oxidative capacity of thigh muscles following knee immobilisation. In all but one of the studies, NMES was shown to be superior in preventing the atrophic changes of knee immobilisation when compared to no exercise, isometric exercise of the quadriceps femoris muscle group, isometric co-contraction of both the hamstrings and quadriceps femoris muscle groups, and combined NMES-isometric exercise. It has also been reported that NMES applied to the thigh musculature during knee immobilisation improves the performance on functional tasks.(ABSTRACT TRUNCATED AT 400 WORDS)

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