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Biophysical Agents

Assessment of Transcutaneous Electrical Nerve Stimulation Efficacy in Pain Management and Muscle Recovery: A Controlled Clinical Trial for Exercise-Induced Muscle Fatigue

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Purpose

To investigate the efficacy of transcutaneous electrical nerve stimulation (TENS) on the duration and magnitude of muscle pain and fatigue following an exercise-induced fatigue protocol.

Methods

Twenty-one participants were tested over three visits. Each visit consisted of an exercise-induced fatigue protocol to the quadriceps muscle followed by one of the three randomized independent treatments: no intervention (*NoTENS*), TENS on the fatigued quadriceps (*TENSactive*), and sham intervention with an inactive TENS (*TENSinactive*) on the fatigued quadriceps. The visual analog scale (VAS) for perceived muscle pain and fatigue levels was recorded before and after exercise, immediately after the designated follow-up protocol, and 24 and 48 hours after the visit.

Results

Post-exercise muscle pain and fatigue decreased immediately following active TENS application to the quadriceps; this decrease persisted 24 hours post-TENS application. Muscle pain and fatigue immediately after active TENS were significantly lower than *NoTENS* and *TENSinactive* treatments. The active TENS also showed significantly faster recovery compared to *NoTENS* and *TENSinactive* protocols.

Conclusions

TENS application immediately after muscle fatigue following exercise was more effective in decreasing muscle pain and muscle fatigue, and improving muscle recovery time compared to no TENS or sham TENS. These findings support the use of TENS as a non-invasive, non-pharmacological evidence-based protocol to manage muscle pain and fatigue after exercise, training, and sports, resulting in reduced muscle pain and fatigue, and shortened muscle recovery time after strenuous exercise for athletes and non-athletes aged between 18 and 45 years old.

INTRODUCTION

Skeletal muscle fatigue is defined as a decrease in the efficiency of muscle force production in response to comparable levels of contractile activity. The most common development mechanisms for muscle fatigue are associated with both metabolic responses to exercise and inflammatory responses elicited by the micro-structural damages imposed on the muscle cells and their connective strata [1,2]. As a result, a broad range of symptoms might emerge, such as

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