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ORIGINAL ARTICLE

Acute effect of electrical muscle elongation and static stretching in hamstring muscle extensibility



Importance de l'effet de l'extension musculaire électrique et de l'étirement statique sur l'extensibilité de la musculature ischio-jambière

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KEYWORDS

Muscle stretching;
Electric current;
Range of movement

Summary

Objective. – The acute effect of electrical muscle elongation (EME) versus static stretching (SS) on hamstring extensibility was analyzed.

Material and methods. – Sixty-three adult athletes with reduced hamstring flexibility (straight leg raise test angle < 80°) were randomly assigned to: group 1 (one EME session of 4 kHz interferential current, bipolar technique and AMF = 100 Hz, n = 21), group 2 (one set of SS, n = 21) or group 3 (control group, n = 21). The hamstring muscle extensibility was assessed immediately before and after the intervention with the passive knee extension test.

Results. – Significant improvements ($p < 0.05$) were found in both EME (+10.09°) and SS (+8.61°) groups whereas no significant changes were detected in control group (+0.09°). Although no significant differences were found between EME and SS groups, the EME group showed large effect size ($d = 0.927$) while SS group reached medium effect size ($d = 0.571$).

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MOTS CLÉS

Étirement musculaire ;
Courant électrique ;
Amplitude de mouvement

Conclusions. – The use of electrical muscle stimulation in adult athletes with restricted hamstring extensibility can achieve immediate improvements in hamstring extensibility, slightly higher than those gained with static stretching.

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Résumé

Objectifs. – L'impact de la stimulation musculaire électrique (SME) et de l'étirement statique (ES) sur l'extensibilité ischio-jambière a été analysé.

Matériels et méthodes. – Soixante-trois sportifs adultes ayant une souplesse ischio-jambière réduite (angle inférieur à 80° lors du test d'élévation de la jambe droite) ont été aléatoirement assignés au groupe 1 (une séance de SME utilisant le courant interférentiel par l'intermédiaire d'une application bipolaire, avec une fréquence de 4 kHz et une amplitude de modulation de la fréquence de 100 Hz, $n=21$) ; groupe 2 (une série d'ES, $n=21$) ; ou groupe 3 (groupe témoin, $n=21$). L'extensibilité de la musculature ischio-jambière a été évaluée juste avant et après l'intervention utilisant le test d'extension passive du genou.

Résultats. – On a trouvé des améliorations significatives dans les groupes SME et ES, tandis qu'aucun changement significatif n'a été détecté dans le groupe témoin. Bien que l'on n'ait pas trouvé de différences significatives entre les groupes SME et ES après l'intervention, on a observé que l'effet était important dans le groupe SME, tandis que, dans le groupe ES, l'effet était modéré.

Conclusions. – L'usage de la stimulation musculaire électrique chez les sportifs adultes ayant une extensibilité ischio-jambière réduite permet d'atteindre d'immédiates améliorations au niveau de l'extensibilité, légèrement plus importantes que celles obtenues grâce à l'étirement statique.

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1. Introduction

Hamstring extensibility is frequently analyzed in the field of sport training and rehabilitation because decreased extensibility has been related to low back pain [1], changes in spinal curvatures [2,3], reduced muscle strength and alterations in motor coordination [4].

For these reasons, several studies have assessed hamstring extensibility in athletes, such as runners [5], paddlers [3,6], and cyclists [7]. Most studies have shown a high percentage of athletes with reduced hamstring extensibility except for rhythmic gymnastics and dancers [8]. Other studies also have found a high incidence of decreased hamstring extensibility in young adults [9,10].

Some researchers have analyzed the short- and medium-term effects of different techniques. The effects of Bowen technique [11], dynamic soft tissue mobilizations [12] and suboccipital muscle inhibition technique [13] on hamstring extensibility have been analyzed. All these techniques have shown their effectiveness increasing the hamstring muscle extensibility. On the other hand, muscle stretching has been frequently used to improve the extensibility of the hamstrings and has shown its effectiveness to improve hip flexion range of movement (straight leg raise test) and knee extension (knee extension test) [14–18].

Recently, electrical muscle elongation (EME) with interferential currents has been suggested as an effective treatment method for different musculoskeletal conditions [19–21]. The EME allows decreasing the nociceptive transmission of the stretching delaying the refractory period of the muscle fibers and increasing the temperature of the

collagen matrix. These responses provide a better gliding capacity and therefore, the muscle connective tissue achieves more flexibility in its deeper layers [22]. However, the effect of this technique on hamstring extensibility has not been analyzed enough.

Therefore, the objective of this study was to compare the short term effect of EME versus static stretching (SS) on hamstring muscle extensibility in young athletes.

2. Material and methods

2.1. Participants

A total of 85 young adults participated voluntarily in the study. The inclusion criteria were: to practice physical exercise at least 3 hours per week and to present a joint range of movement lower to 80° in the straight leg raise test, following the measuring protocol described by Kendall et al. [23]. The exclusion criteria were:

- to participate in any organized hamstring muscle stretching program;
- current low back pain or musculoskeletal pain in lower limbs;
- recent spinal or abdominal surgery.

The final sample was comprised of 63 subjects (37 males and 26 females) (Fig. 1). The characteristics of the sample are presented in Table 1.

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