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Original Research

Leg Immersion in Warm Water, Stretch-Shortening Exercise, and Exercise-Induced Muscle Damage

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Abstract

Context: Whether muscle warming protects against exercise-induced muscle damage is unknown.

Objective: To determine the effect of leg immersion in warm water before stretch-shortening exercise on the time course of indirect markers of exercise-induced muscle damage.

Design: Crossover trial.

Setting: Human kinetics laboratory.

Patients or Other Participants: Eleven healthy, untrained men (age = 21.5 ± 1.7 years).

Intervention(s): Participants' legs were immersed in a water bath at 44 ± 1°C for 45 minutes.

Main Outcome Measure(s): Creatine kinase changes in the blood, muscle soreness, prolonged (within 72 hours) impairment in maximal voluntary contraction force and height of drop jump, and electrically evoked muscle force at low and high stimulation frequencies at short and long muscle lengths.

Results: Leg immersion in warm water before stretch-shortening exercise reduced most of the indirect markers of exercise-induced muscle damage, including creatine kinase activity in the blood, muscle soreness, maximal voluntary contraction force, and jump height. The values for maximal voluntary contraction force and jump height, however, were higher during prewarming than for the control condition at 48 hours after stretch-shortening exercise, but this difference was only minor at other time points. Muscle prewarming did not bring about any changes in the dynamics of low-frequency fatigue, registered at either short or long muscle length, within 72 hours of stretch-shortening exercise.

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Conclusions: Leg immersion in warm water before stretch-shortening exercise reduced most of the indirect markers of exercise-induced muscle damage. However, the clinical application of muscle prewarming may be limited, because decreasing muscle damage did not necessarily lead to improved voluntary performance.

Keywords: electric stimulation, muscle length, neuromuscular performance, time course

Albertas Skurvydas, PhD, contributed to conception and design; analysis and interpretation of the data and drafting and final approval of the paper. Sigitas Kamandulis, PhD, contributed to acquisition and analysis and interpretation of the data and drafting and final approval of the paper. Aleksas Stanislovaitis, PhD, and Vytautas Streckis, PhD, contributed to acquisition of the data and drafting, critical revision, and final approval of the paper. Gediminas Mamkus, PhD, and Adomas Drazdauskas, PhD, contributed to analysis and interpretation of the data and critical revision and final approval of the paper.

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