Total and Peripheral but not Central Neuromuscular Fatigue after Simulated Trail Running in Trail Runners

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ABSTRACT

Trail running is an increasingly popular endurance sport with races over variety of distances and terrains. Those prolonged running elicits a decrease in muscle power output mediated by a reduction in neuromuscular function. However, the evaluation of neuromuscular function is still limited in trail runners and difficult on the field setting. We determined the effects of simulated trail running on neuromuscular function in trail runners. Nine trail runners (42 ± 5 years) with 4.2 ± 1.3 years of trail-running practice were studied. Their maximal oxygen consumption was 34 ± 6 ml/kg/min and knee extension/flexion torque measured on the Cybex machine was 122 ± 46/53 ±15 Nm. The simulated single bout of exercise, trail running included 30 min of 15% grade uphill running at 75% of heart rate reserve (HRR) and 30 min of 15% grade downhill running at 40% HRR on treadmill. Before and after the running, transcutaneous electrical stimulations were applied to the femoral nerve and a constant-current stimulator delivered a square-wave stimulus of 1-ms duration and 400-V maximal voltage. The intervals of the stimuli in the doublet at 10 Hz and 100 Hz were 10 and 100 ms. After treadmill running test, quadriceps maximal voluntary contraction decreased by 13.8% ($p<0.05$). Rectus femoris M-wave (a measure of peripheral fatigue) decreased by 20.1% ($p<0.05$). No significant changes were observed in central fatigue as assessed by maximal voluntary activation. These data showed that simulated trail running that combines uphill and downhill treadmill running produced total and peripheral fatigue but not central fatigue in trail runners. Such treadmill running test could be used as an experimental tool to investigate neuromuscular fatigue in trail runners.

Keywords: Trail running, Maximal oxygen consumption, Neuromuscular fatigue, Maximal voluntary contraction, Maximal voluntary activation

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