Neuromuscular responses of the superficial quadriceps femoris muscles: Muscle specific fatigue and inter-individual variability during severe intensity treadmill running

Bergstrom H.C.

Housh T.J.

Dinyer T.K.

Byrd M.T.

Jenkins N.D.M.

Cochrane-Snyman K.C.

Succi P.J.

Schmidt R.J.

Johnson G.O.

Zuniga J.M.

Objectives: This study examined the time course of changes and patterns of responses in electromyographic amplitude (EMG AMP) and EMG mean power frequency (MPF) for the superficial quadriceps muscles during exhaustive treadmill runs within the severe exercise intensity zones (SIZ1 and SIZ2). Methods: The EMG signals for the vastus lateralis (VL), rectus femoris (RF), and vastus medialis (VM) as well as times to exhaustion (Tlim) were recorded in ten runners during two exhaustive treadmill runs (SIZ1 and SIZ2). The composite and individual responses were compared among muscles and between intensities. Results: The composite patterns of responses in EMG AMP (linear, quadratic, and cubic increases; r2 /R2 =0.684?0.848) and EMG MPF (linear, quadratic, and cubic decreases; r2 /R2 =0.648 ? 0.852) for the VL and RF were consistent with neuromuscular fatigue in both zones, but those for the VM were not (quadratic, cubic, and non-significant relationships with responses near baseline). The RF tended to demonstrate greater fatigue (EMG MPF decreased from 80?100% Tlim). There was large inter-individual variability (only 10?60% of responses consistent with composite) in response to fatiguing treadmill running. Conclusions: The

current findings support the examination and characterization of neuromuscular fatigue on an intensity, muscle, and subject-by-subject basis.

Critical Velocity

Individual Responses

Neuromuscular Fatigue

Superficial Quadriceps

Treadmill Running

adult

Article

controlled study

demography

electromyography

female

follow up

human

human experiment

male

muscle fatigue

neuromuscular function

physical activity

quadriceps femoris muscle

questionnaire

rectus femoris muscle

signal processing

superficial quadriceps femoris muscle

treadmill exercise

vastus lateralis muscle

vastus medialis muscle

velocity