ABSTRACT

Background: Unaccustomed eccentric exercise during sport or training may lead to delayed onset muscle soreness (DOMS), which has been demonstrated to influence postural control, potentially resulting in further injury. Afferent sensory input is critical to effective postural control, but little is known about somatosensory changes at the knee following induction of DOMS of the quadriceps muscle. The ‘soreness’ or hyperalgesia associated with DOMS has been postulated to occur because of damage to/inflammation of the exercised muscle, however, effects on central nociceptive mechanisms, which are known to induce altered postural responses, have been less studied.

Purpose/Hypothesis: It was hypothesized that DOMS of the quadriceps muscle would result in widespread hyperalgesia and hypoesthesia at the knee. Therefore, the purpose of this study was to investigate the effects of DOMS on knee somatosensory changes in asymptomatic healthy participants.

Study Design: Quasi-experimental cohort study

Methods: Thirty participants (15 males and 15 females) took part in the study. Eccentric exercise consisted of 10 sets of 10 maximum eccentric quadriceps contractions performed with the dominant knee. Outcome measures consisted of pain intensity (Visual Analog Scale), pressure pain threshold (PPT), vibration perception threshold (VPT) and proprioception, measured via threshold to detection of passive motion (TDPM) at the knee, at three different assessment time points: (1) pre-eccentric exercise; (2) immediately and (3) 48 hours post-eccentric exercise.

Results: Not surprisingly, pain intensity increased and PPT of the vastus medialis and rectus femoris muscles decreased (hyperalgesia) immediately post-exercise on the exercised limb. However, at 48 hours, hyperalgesia was demonstrated at other lower extremity muscles, including bilaterally at the tibialis anterior muscles, and also at the hand. Evidence of hypoesthesia was also demonstrated. VPT and TDPM increased (worsened) ipsilaterally both immediately and 48 hours after exercise, and TDPM increased bilaterally at 48 hours. Females demonstrated greater impairment in TDPM than males at 48 hours. Expanding distribution of hyperalgesia, ipsilaterally impaired VPT and bilaterally impaired proprioception were demonstrated in the presence of DOMS.

Discussion/Conclusion: Inflammation from unaccustomed eccentric exercise may induce neuroplastic changes in nociceptive pathways resulting in wider distribution of pain and hypoesthesia. Futures studies examining the effect of DOMS related somatosensory changes on postural control may be warranted.

Level of evidence: 3

Key words: Eccentric exercise, exercise-induced damage, gender, knee, quantitative sensory

CORRESPONDING AUTHOR

Carol A. Courtney, PT, PhD
Northwestern University
Department of Physical Therapy and Human Movement Science
645 N. Michigan Ave, Suite 1100
Chicago IL 60611
Phone: 312-503-2603
E-mail: Carol.courtney@northwestern.edu