Impact of Exercise-Induced Muscle Soreness on Body Representation

Cécile Scotto*[1], Charly Ferrier[2], Laurent Bosquet[3], and Lucette Toussaint[2]

[1]Centre de Recherches sur la Cognition et l'Apprentissage [UMR 7295] – Université de Poitiers = University of Poitiers, Université de Tours, Centre National de la Recherche Scientifique, Université de Tours – France

[2]Centre de Recherches sur la Cognition et l'Apprentissage [UMR 7295] – Université de Poitiers = University of Poitiers, Université de Tours, Centre National de la Recherche Scientifique, Université de Tours – France

[3]Laboratoire Mobilité, Vieillissement, Exercice – Université de Poitiers = University of Poitiers – France

Résumé

Introduction:
Recent studies have shown that immobilization alter internal representations of the body (e.g., Toussaint et al., 2023). In this experiment, we explore whether the *overuse* of limbs-leading to delayed-onset muscle soreness (DOMS)-may produce similar effects. DOMS, which occur 24–72 hours post-exercise, involve a delayed recovery phase marked by neuromuscular fatigue and pain. A recent hypothesis attributes DOMS to damage of muscle spindle afferents rather than muscle fibers (see Sonkodi et al., 2020). Based on that idea, we hypothesize that DOMS impair the central nervous system's ability to integrate body representations based on proprioception. More specifically, we seek to determine whether the limbs overuse-leading to soreness-disrupt the perception of the position and movement of body segments, similar to the effects already documented for fatigue (see Proske & Chen, 2021) and chronic pain (e.g., Toussaint et al., 2025).

Methods:

Participants were recruited from the Faculty of Sport Sciences of Poitiers and divided into two groups: a DOMS group (N = 47), which performed a full-body exercise session (i.e., arms & legs) emphasizing eccentric phases, and a Control group (N = 47), which did not perform that exercise. First, both groups completed a questionnaire assessing perceived pain in their limbs (i.e., arms and legs) using a visual analog scale ranging from 0 to 10. All participants then completed 3 mental rotation tasks involving 1) left and right arms, 2) left and right legs and 3) the number 2 and its mirror images. The stimuli were presented in various orientation in the image plane and rotated either clockwise or counterclockwise. The DOMS group performed the task 48 hours after the exercise session. For the limb mental rotation tasks, participants were asked to determine whether the image depicted a left or right limb by pressing the corresponding keyboard key. For the control task involving numbers, participants judged whether the figure was the number "2" or its mirror image.

*Intervenant

Results:

Repeated-measures ANOVAs were conducted on reaction time (RT) and percentage of correct responses, using a mixed design with a between-subjects factor Group (i.e., Control vs. DOMS) and two within-subjects factors: mental rotation tasks (i.e., arm/leg/number) and Orientation. While DOMS had no significant effect on mental rotation accuracy (i.e., % correct), a significant Group × Task interaction was observed for RT ($F(2,184) = 4.6$, $p < .05$). Specifically, DOMS significantly increased RTs in the arm mental rotation task ($p < .05$) and showed a trend toward significance in the leg mental rotation task ($p = .06$), whereas no group differences were found for the task that did not involve a body segment (i.e., number; $p = .55$).

Discussion:

DOMS may not affect the accuracy of limb laterality judgments, suggesting that body schema remains intact. However, reaction times were slower in the DOMS group for arm (and marginally leg) tasks, indicating a specific slowdown in sensorimotor processing related to the internal representation of the body. The Group × Task interaction on RT supports the idea that this delay is specific to tasks involving body representations, rather than a general cognitive slowdown. Slower RT may reflect the compensatory processing needed to update or rely on the sore muscles due to degraded proprioceptive information. These results may guide motor rehabilitation and performance strategies.

References

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