Role of feedback from Group III and IV muscle afferents in perception of effort, muscle pain, and discomfort

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TO THE EDITOR: In their recent paper, Amann and colleagues (1) report an experiment in which they used a powerful analgesic, fentanyl, to block afferent feedback from Group III and IV neurons innervating the locomotor muscles. The authors investigated the effects of this experimental treatment on various physiological and perceptual responses to cycling exercise at different power outputs. Interestingly, at 325 W (80% of peak power output), “the rating for limb discomfort in the fentanyl trial was ~13% lower” (page 970). The authors concluded that this finding confirms the critical role of afferent feedback from locomotor muscles in determining perception of effort. We have two main reasons to doubt the validity of such conclusion.

First, if “RPE limb” was a proper measure of perception of effort, the effect of fentanyl at 325 W (Table 2, Ref. 1) would suggest that the role of afferent feedback from locomotor muscles in determining perception of effort is far from critical. In fact, the 13% reduction in “RPE limb” observed in the fentanyl trial would suggest that 87% of perception of effort is determined by another factor: awareness of central command to the locomotor muscles! This finding goes against the popular belief that perception of effort primarily reflects afferent feedback from the body (9, 10).

Second, Amann and colleagues (1) defined “RPE limb” as limb discomfort, not perception of effort. As we previously argued (6), defining RPE as discomfort is not correct because comfort/discomfort is a dimension (called affective valence) of every sensation (2). Therefore, when asked to rate limb discomfort, subjects rate the discomfort associated with a variety of sensations experienced during cycling exercise, not just perception of effort. These sensations include muscle pain, joint and foot pressure, and muscle tension (5).

Exercise-induced muscle pain is particularly relevant to the study of Amann and colleagues (1) because it is generated by stimulation of Group III and IV muscle afferents by various substances including lactic acid (8). Therefore, the small reduction in limb discomfort measured at 325 W is most likely caused by the analgesic effect of fentanyl on exercise-induced muscle pain, not a reduction in perception of effort. This conclusion is supported by the fact that “RPE limb” was significantly reduced only at 325 W (capillary blood lactate ~7 mM), the only power output above the threshold at which exercise-induced muscle pain normally occurs (50% of peak power output) (3). The other three power outputs (50–100-150 W, capillary blood lactate <1.4 mM) were well below such pain threshold. Therefore, it is not surprising that fentanyl did not have any significant effect on “RPE limb” at these low power outputs.

This discussion should remind us that, albeit simple, perceptual measures need to be administered carefully to collect valid data. When instructing people on how to use the RPE scale, perception of effort should be defined as “the conscious sensation of how hard, heavy, and strenuous exercise is” (7) not as discomfort or muscle pain. These sensory constructs are conceptually and neurophysiologically distinct from perception of effort, and they should be quantified using separate scales with separate instructions (3, 4).

DISCLOSURES
No conflicts of interest, financial or otherwise, are declared by the authors.

REFERENCES