TO THE EDITOR: The topic of this Point:Counterpoint, as suggested by Dr. Marcora, was to debate the relative importance of afferent feedback from fatiguing locomotor muscles in determining endurance performance. Being well aware of the fact that this feedback is only one of numerous determinants (5), we presented existing data documenting its crucial role in this process. Based on the title of this discussion, we expected our opponent to try to convince us, and the reader, otherwise. However, we missed clear counter-arguments and rather faced a shift in the debate toward the, without doubt, important role of psychological factors, which is, as emphasized by Dr. Millet (see Ref. 6), not disregarded by our argumentation. But the importance of psychological factors in determining endurance performance was not the issue here.

The broad interest in this topic is impressive and we would like to thank all authors for their comments, which mostly affirm our side of the debate. Due to space limitations, we can only rebut/respond to a few concerns/remarks.

Dr. Impellizzeri (see Ref. 6) points out potential direct effects of lumbar intrathecal fentanyl on cerebral opioid receptors (due to cephalad migration). This is unlikely based on our extensive evaluation of the subjects’ ventilatory sensitivity to various levels of arterial PCO2 (at rest). Would fentanyl have reached/passed the ventrolateral-medulla/dorsolateral-pons, respiratory control would have been substantially compromised (4); this was clearly not the case. Additionally, no detectable level of fentanyl was found in the systemic circulation.

As pointed out by Drs. Girard/Place/Meeusen/Millet (see Ref. 6), we recognize that the fact that power output is chosen too high to be maintained when the central projection of muscle afferents is pharmacologically reduced (1), does not automatically disregard the importance of other environmental factors, like severe hypoxia (2), in determining CMO. Furthermore, in certain situations, afferent feedback from the exercising muscle might even be trivial (i.e., final sprint).

In response to Drs. Nakamura/Prilutsky (see Ref. 6), we emphasize that the group III/IV-mediated cardiovascular and ventilatory responses to exercise are reflexively mediated with metabolosensitive fibers depicting the afferent arm. However, group III/IV influences on CMO are, in addition to their effects on the excitability of motoneurons, also exerted through “negative feedback” to the cortex, which can apparently been “overridden” as suggested by the voluntary increase in the output from the motoneuron pool and power output toward the end of a race.

Finally, we want to highlight the excellent point by Dr. Taylor (see Ref. 6). Our opponent claims that the sense of effort is not influenced by muscle afferents but rather derived from a corollary of CMO. Furthermore, according to him, the brain allegedly regulates exercise performance to keep the sense of effort at a “tolerable” level (i.e., sense of effort being the regulated variable). Based on these considerations, he hypothesizes that afferent feedback is not an important determinant of endurance exercise performance. However, Dr. Marcora unfortunately forgets that, even if this part was true, metabolosensitive muscle afferents can still affect exercise performance via their impact on the excitability of motoneurons and thus their impact on the output from the motoneuron pool (3).

REFERENCES


Markus Amann1 and Niels H. Secher2

1Department of Internal Medicine, University of Utah, Salt Lake City, Utah; 2Department of Anesthesia, The Copenhagen Muscle Research Center, Rigshospitalet, University of Copenhagen, Denmark

Address for reprint requests and other correspondence: M. Amann, Dept. of Internal Medicine, Univ. of Utah, VA Medical Center, GRECC 182, 500 Foothill Dr., Salt Lake City, UT 84148 (e-mail: markus.amann@utah.edu).