

Amann, M., & Light, A. R. (2014). Reply. *Experimental Physiology*, 99 (5), 836. (IR #18710)

Response to Letter by Dr. Smirmaul

Group III/IV muscle afferents contribute to both perception of effort and fatigue

Markus Amann^{1,2} and Alan R Light²

¹Departments of Medicine & ²Anesthesiology

University of Utah, USA

We thank Dr. Smirmaul for his interest in our findings, but advise caution not to over-interpret the data to address a question which would have required an entirely different study design. Specifically, the letter to the editor is strongly focused on effort perception, a variable which was, as expected, not considered as a descriptor by the participants when asked to report evoked sensations (Pollak *et al.*, 2014). In fact, given the absence of any sort of muscle contraction or task in our study (i.e. there was no required effort to be rated), an altered effort perception would have been rather unusual.

In addition to having missed this critical fact, we disagree with the main postulate of the letter and need to remind the author about existing evidence documenting an independent role for *both* central command and muscle afferent feedback in determining the perception of effort during exercise. In other words, while effort may be evoked without increases in metabolites, the amount of perceived fatigue is definitely altered by afferent feed back. On the one hand, experiments utilizing curare to increase central command while leaving muscle afferent feedback unchanged during a given task have reported a facilitating effect of central command on effort perception [e.g., (Gandevia & McCloskey, 1977; Gallagher *et al.*, 2001)]. On the other hand, studies utilizing fentanyl to block group III/IV muscle afferents while leaving central command

unchanged during exercise document a significant contribution of neural feedback to the perception of effort associated with physical activity [e.g., (Amann *et al.*, 2011; Gagnon *et al.*, 2012)].

Taken together, the line of reasoning used in the letter is refuted by the following factors: (i) the fact that subjects were instructed not to attempt to move their thumb excluded any physical effort to be rated/perceived (which explains the lack of this variable on the participant-driven list of descriptors); and (ii) the well-documented contribution of both central command and muscle afferent feedback to effort perception. While we agree with the author that afferent feedback is the main contributor to sensation of muscle fatigue, we disagree with the claim that our findings suggest that afferent feedback does not contribute to effort perception.

References

- Amann M, Blain GM, Proctor LT, Sebranek JJ, Pegelow DF & Dempsey JA. (2011). *J Physiol***589**, 5299-5309.
- Gagnon P, Bussieres JS, Ribeiro F, Gagnon SL, Saey D, Gagne N, Provencher S & Maltais F. (2012). *Am J Respir Crit Care Med***186**, 606-615.
- Gallagher KM, Fadel PJ, Stromstad M, Ide K, Smith SA, Querry RG, Raven PB & Secher NH. (2001). *J Physiol***533**, 861-870.
- Gandevia SC & McCloskey DI. (1977). *J Physiol***272**, 673-689.
- Pollak KA, Swenson JD, Vanhantsma TA, Hughen RW, Jo D, Light KC, Schweinhardt P, Amann M & Light AR. (2014). *Exp Physiol***99.2**, 368-380.