Review of: "Sustained Muscle EMG Activity to Contractile Failure During Incremental Exercise and Intense Constant Load Cycling: No Evidence of a Central Governor"

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Potential competing interests: No potential competing interests to declare.

As my expertise is in EMG recording and analysis, and I am not familiar with the central governor model, I have primarily focused on EMG data collection and processing, although I have a number of questions for clarification. My comments and questions are given below.

P 5:

Data collection: Please define the abbreviation CP (critical power) and indicate that the CP tests are described in a subsequent section. Also, please add a description of what critical power means in the context of your work.

Is the preferred cycling cadence that you recorded for each subject during the familiarization trial the cadence that they were asked to use in all subsequent testing? If so, I suggest adding this to the participant information given in Table 1.

You say, “Participants were asked to perform a ramp-based exercise protocol to volitional fatigue, ranging from 25 - 40 Watts·min^{-1} between participants (determined prior based on self-reported fitness levels and with intent to reach volitional exhaustion).” Can you describe how the power levels are adjusted, e.g., by increasing the pedal resistance? In addition to ECG, were gas exchange data collected in order to determine VO_2 max?

P 6:

I don’t fully understand your critical power testing protocol. Are these constant power trials where participants are asked to maintain their preferred cadence?

Is $Y = Span \cdot e^{-k \cdot x} + Plateau$ equation 1? Please define the variables.

Muscle electromyography: Did you collect isometric maximum voluntary contraction (MVC) data from subjects prior to starting the experimental protocols? Were the EMG signals amplified and filtered prior to sampling? Why do you think the data from the biceps femoris and gastrocnemius were “complex and weak,” such that you removed these data from your analysis? Since the EMG is a complex signal, what do you mean when you say “complex” here? When you say “due to variation in signal to noise of the sEMG signal,” is the variability between trials or within trials? In addition, I suggest changing the phrase to “due to variation in the signal to noise ratio (SNR) of the sEMG signal.”

P 7:

Did you perform any preprocessing (e.g., digital filtering, normalization) on the sEMG data before computing the root mean square (RMS) and mean (MNF) and median (MDF) frequency values? How were the parameter values calculated, i.e., were the data divided into segments (how long, overlap/no overlap), and were the RMS, MNF, and MDF values calculated over the segments? In regard to the linear regressions, you say that the “range of segment 2 was predetermined, and the range of segment 1 was defined by the data segment having the least residuals error,” where segment 2 was the last 30 seconds of the trial. By range of segment 1, do you mean where it occurred over time (e.g., from minute 1 to minute 1:30), or that the segment duration varies, or both?

Statistics: you refer to variables RER, peakVI, peakFbr, and peakVt. RER has been defined as the respiratory exchange ratio; please define the other variables.

P 8:

You say, “quality data for the Gmax was only evident for 8 of the 14 subjects.” How did you assess the quality of the sEMG data?

P 9:

I find Figure 1 confusing. I assume that this is a plot of sEMG results from the VL, but that is not stated. Why is the time scale for plot a) different from the time scales of plots b)-d)? The red plots are presumably the raw EMG data - how are these related to the RMS plots (i.e., in duration and amplitude); what do the numbers beside these plots mean (as well, these numbers are unreadable in a) and b))? The durations of the recorded sEMG signals are apparently shorter with the increasing level of effort; please note the durations of these signals in the caption.

When you say, “The descriptive characteristics of the subjects are presented in Table 1, along with pertinent variables from the exercise testing,” which test are you referring to (VO2max testing)?

P 12:

Discussion

I appreciate the discussion of muscle (peripheral) fatigue in this section. It has been shown, at least under isometric, isotonic conditions, that EMG signal amplitude increases with fatigue [1]; did you consider examining how much potential increase in the signal RMS value is due to fatigue, since you computed the MNF and MDF values? I suggest for future studies that you try to separate the effects of fatigue and recruitment/rate coding on the increasing EMG amplitude (see ref [2] for methods of assessing the presence of fatigue), and that you could consider EMG decomposition to see the recruitment profile (e.g., [3]).

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3. D. Farina and A. Holobar, "Characterization of human motor units from surface EMG decomposition," in Proceedings of the IEEE, vol. 104, no. 2, pp. 353-373, Feb. 2016.