

Review of: "Modelling Skeletal Muscle Motor Unit Recruitment Contributions To Contractile Function: Part 1 — Velocity, Force and Power"

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Potential competing interests: No potential competing interests to declare.

The manuscript proposes an interesting model of the skeletal muscle that potentially may be useful to study processes of motor unit recruitment. However, the authors should take into consideration some comments below that should ameliorate the quality of the modelling.

1. The muscle force may be controlled by the central nervous system with two basic mechanisms: first, the recruitment of motor units into activity (and this mechanism is incorporated in the model), and changes in the motoneuronal firing rate and pattern (rate coding, the mechanism not taken into account in the model). Moreover, the “all or nothing” principle concerns only the single twitch of skeletal muscle or motor unit, and the duration of this twitch is very short (measured in milliseconds). During voluntary activity of muscles, their motor units generate unfused tetanic contractions, and their force (and duration) depends on the firing rate of recruited motoneurons. These facts should be at least discussed in a chapter on “limitations.”
2. The model concerns the human vastus lateralis. The authors have made some arbitrary assumptions that are far away from the available experimental data. For example, the number of motor units is overestimated – e.g., please see the review “Distribution of motor unit properties across human muscles,” Jacques Duchateau and Roger M. Enoka, doi.org/10.1152/jappphysiol.00290.2021. I believe that using these data, it is possible to considerably increase the realism of the model.
3. The authors of the manuscript have proposed 5 types of motor units in their model (related to the myosin content in muscle fibers of motor units). I understand the idea of this assumption; however, for animal hindlimbs (e.g., for cat medial gastrocnemius, Burke et al. 1973, *J. Physiol.*) or human lower limbs (gastrocnemius, Garnett et al. 1979, *J. Physiol.*), rather three basic types of motor units were distinguished (S, FR, and FF), related to three forms of activity: standing, walking, running (please see also “Firing patterns of motor units in normal rats,” R Hennig, T Lomo, 3974720 DOI: 10.1038/314164a0). Therefore, it seems rational to model the vastus lateralis with 3 types of motor units.
4. The chapter “historical studies” seems to be not connected to the presented results and rather should be removed from the manuscript.
5. I suggest rewriting the chapter “models in science” and comparing the proposed model to other muscle models based on simulation of motor unit activity present in the literature (e.g., recent review doi.org/10.1016/j.jelekin.2023.102774)
6. Note that Brooke and Kaiser originally proposed muscle fiber types SO, FOG, and FG.

