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**Parameter estimation and experimental design for Hill-type muscles: impulses from optimization-based modeling.** (English) [Zbl 1453.92035](#)

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**Summary:** The benefits of optimization-based modeling for parameter estimation of Hill-type muscle models are demonstrated. Therefore, we examined the model and data of *M. Günther* et al. [*Biol. Cybern.* 97, No. 1, 63–79 (2007; [Zbl 1125.92007](#))], who analyzed isometric, concentric, and quick-release contractions of a piglet calf muscle. We found that the isometric experiments are suitable for derivative-based parameter estimation while the others did not provide any additional value. During the estimation process, certain parameters had to be fixed. We give possible reasons and provide impulses for modelers. Subsequently, unnecessarily complex or deprecated model parts were exchanged and the new model was fitted to the data. In order to be able to provide a reliable estimation of the whole parameter set, we propose two isometric and two quick-release experiments, which are real-life feasible and together allow an identification of all parameters based on a local sensitivity analysis. These experiments can be used as qualitative guidelines for practitioners to reduce the experimental effort when estimating parameters for macroscopic muscle models.

**MSC:**

92C10 Biomechanics

92-05 Experimental work for problems pertaining to biology

**Keywords:**

Gauss-Newton method; biomechanics

**Software:**

ADIFOR; PAREMERA; SNOPT

**Full Text:** [DOI](#)

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