

In Response To:

Castrillo-Fraile V, Peña EC, Gabriel Y, Galán JMT, Delgado-López PD, Collazo C, Cubo E. Tremor control devices for essential tremor: a systematic literature review. *Tremor Other Hyperkinet Mov.* 2019;9. doi: 10.7916/tohm.v0.688

Letters

The Validation of Tremor-Cancelling Technologies Needs a Multidisciplinary Consensus Statement

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Keywords: Tremor control technology, tremor suppression technology, tremor-cancelling technology

Citation: López-Blanco R, Benito-León J, Hernández-Gallego J, Sánchez-Ferro Á. The Validation of Tremor-Cancelling Technologies Needs a Multidisciplinary Consensus Statement. *Tremor Other Hyperkinet Mov.* 2020; 10. doi: 10.7916/tohm.v0.765

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Editor: Elan D. Louis, Yale University, USA

Received: January 13, 2020; **Accepted:** January 31, 2020; **Published:** February 26, 2020

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Funding: None.

Financial Disclosures: None.

Conflict of Interest: The authors report no conflict of interest.

Ethics Statement: Not applicable for this category of article.

Dear Editor

We read with interest the review by Castrillo-Fraile et al.¹ on tremor-control devices for essential tremor (ET). This is the first clinical review in which these systems have been analyzed thoroughly and helps to fill in the knowledge gap regarding the role of these technologies in assisting ET patients. However, there are three aspects that need further development.

First, tremor-cancelling devices are based on different approaches: wearable exoskeletons, orthoses, and handheld external devices, such as spoons. Nevertheless, computer softwares or hardwares to control kinetic tremor caused due to the mouse of a PC in ET patients were not included in this review.^{2,3} It would be interesting to consider them in upcoming studies due to their potential applications in daily-life and industries.

Second, as the authors emphasize in their systematic review, the evidence documented so far is scant, partly due to the different methodologies

and the scarce number of subjects included in these studies. We would also like to underline the lack of independent testing outside the initial ones and also the scant publications of negative studies, which are crucial to understand important methodological and technological issues that could surely result in the improved development of otherwise encouraging solutions.^{4,5}

Finally, in this review, some methodological aspects are discussed, such as the body location, the clinical outcomes used and some technological features of certain tremor-cancellation prototypes. However, in our opinion, the authors missed a key methodological issue, which is the inherent variability of tremor intensity during testing.⁶ This is something that we have consistently observed in various research studies related to tremor-cancelling systems even after modifying the test length and the temporal windows used in the analyses.^{7–11} Importantly, non-stimulation periods may even show greater tremor-intensity fluctuations when testing a novel device⁴ as compared to those used for stimulation.

This issue can confound the interpretation of testing protocols that do not include long enough nonstimulation periods, although their ideal duration also remains to be defined.

Besides, considering these issues in future studies, a more permanent solution might include the creation of a multidisciplinary group that establishes consensus statements on recommendable methodologies for validating tremor-cancelling technologies, similarly to what is happening in other movement disorders.^{12–14}

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