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LETTER TO THE EDITOR

Conceptual and methodological considerations in the assessment of the neuromuscular function by means of tensiomyography

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Dear Editor-in-chief,

With great interest, we read the recent article by Maeda et al. [7] entitled "Symmetry tensiomyographic neuromuscular response after chronic anterior cruciate ligament (ACL) reconstruction". This article contributes to the ongoing debate regarding the potential use of tensiomyographic (TMG) screening in the follow-up of muscular injuries and muscle symmetries assessment in sport or clinical settings [1, 2]. In this article, the main conclusion was that the presence of strength and symmetry deficits in the vastus medialis and biceps femoris suggests the need for long-term postoperative training following ACL reconstruction. Although the conclusion reported by the authors is quite interesting, some conceptual and methodological issues involving the TMG screening, which might affect their results, have been detected.

1. There are some conceptual and methodological issues in the whole text that makes difficult to clarify what was the real purpose of the study, so it could lead the reader to confusion. Firstly, the authors indicate in the abstract that "tensiomyography is a recent method to assess muscle strength"; however, this is not true as TMG only assess muscle contractile properties. In fact, there is no study in the literature that has used the TMG to measure muscle strength. Secondly, the authors indicated both in the abstract and introduction that the purpose of the study was "to evaluate motor unit recruitment and investigate the effects on mechanical and contractile characteristics of the quadriceps and hamstring muscles after chronic ACL reconstruction". However, the authors did not evaluate motor unit recruitment as they did not use any technique (e.g., surface electromyography) to address this purpose nor is it renamed throughout the text. The above is very confusing as it seems that they wanted to use the TMG for such purpose.
2. The authors reported two studies in which TMG has demonstrated excellent reliability, with intra-class correlation coefficient (ICC) test–retest values between 0.8 and 0.9 for all its parameters including sustained time (Ts), and half-relaxation time (Tr) [4, 12]. However, the above is biased as the authors did not report the degree of dispersion and measurement error of those studies, i.e., coefficient of variation (CV), random error (RE), standard error of measurement (SEM) or others. In this regard, Tr and Ts were just measured in one (i.e., between-day reliability) of the two studies reported by the authors, showing high RE (Tr = 2.60–6.19; Ts = 6.57–8.64), high SEM (Tr = 1.70–4.12; Ts = 4.99–5.46) and low-to-moderate CV (Tr = 6.4–9.3%; Ts = 3.3–4.9) compared to the other TMG-derived contractile parameters [12]. Although Maeda et al. [7] did not provide reliability scores for each muscle and parameter, very high values of standard deviation can be observed in Table 3 for Tr and Ts depending on the evaluated muscle and the group condition. In this regard, it has been recently pointed out

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that providing reliability scores of each muscle and parameter of TMG can optimize and reduce possible errors of measurement [8]. Furthermore, there is evidence from a well-designed reliability study not supporting the use of Tr due to its insufficient reliability [13].

3. The way in which the authors carried out the TMG measurements is unclear. They indicated that the measurement protocol of Rey et al. [10, 11] was performed; however, this is confusing as they refer to two studies which used different intensities (i.e., 50–75–100 mA or single stimulation at 75 mA, respectively). Subsequently, they indicated the use of a different protocol (i.e., initial amplitude of 50 mA and increments of 10 mA until maximal twitch response) which does not match any of the above references. Furthermore, the authors did not indicate the inter-electrode distance (EID) nor what curve was selected for the analysis (i.e., supramaximal or maximal). In this regard, Tous-Fajardo et al. [13] have reported that EID could influence the main outcomes due to alterations in the spatial recruitment of muscle fibres, concluding that decreasing IED from ±5 to ±3 cm would have resulted in lower and more superficial spatial recruitment of muscle fibres as shown in the literature [3, 9].
4. Lastly, the authors reported in their study that Tr and Ts are used to assess fatigue, but there is no evidence to date in the literature to support that statement, although there are several articles about TMG (>8) that speculatively allude to it. In fact, there are no studies that have validated or correlated Tr or Ts against a gold standard method of fatigue. To date, the maximal displacement is the sole parameter that has shown correlation with fatigue [5, 6].

From the available literature on TMG and the authors' experience, several methodological issues could have affected the TMG measurements (i.e., EID, no test–retest measurement and lack of clear protocol explanation). Thus, all the above could have affected the muscle symmetries calculation, which was one of the purposes of their study. When reporting TMG measurements, it is highly important to provide a full, clear and detailed explanation of how the data were collected to avoid possible measurement errors and improve the understanding of the method, especially by scientists and physicians [8].

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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Ethical approval This study did not involve human participants.

Informed consent This study did not involve human participants so informed consent were not needed.

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