



Letter to the Editor

Reply to “Motor Unit Number Index (MUNIX) and Compound Muscle Action Potential”



We have read with great interest the letter by Nandedkar et al. (2019) in response to our report (Bostock et al., 2019) on the relationship between motor unit number index (MUNIX) and compound muscle action potential (CMAP) amplitude, which used data from our former study (Jacobsen et al., 2017) and a theoretical analysis.

Nandedkar and colleagues reply to our paper by presenting findings in abductor pollicis brevis (APB) muscles of 22 patients with amyotrophic lateral sclerosis (ALS) (probable or definite), using the automated MUNIX program according to recently published guidelines (Nandedkar, 2018). These recent guidelines recommend at least 20 surface interferential pattern (SIP) epochs of more than 300 ms, preferably 500 ms, instead of the 10 epochs of 300 ms which were prescribed earlier (Nandedkar et al., 2010). Our data were collected before the recent guidelines were published, so we cannot exclude that use of the earlier instructions may have adversely affected our results, but it seems unlikely that this would have made a substantial difference.

Unfortunately, by responding to our critique with new data, collected in a slightly different way, Nandedkar and colleagues have not answered our primary objection to the MUNIX method, namely that it implicitly assumes that motor unit size information is retained when motor unit potentials overlap, whereas in reality it is rapidly lost. All they have done is to provide another illustration of the limited circumstances in which MUNIX applies. The waveforms in their Fig. 1B show, at the top, two control SIPs showing overlap, and at the bottom two ALS SIPs with virtually no overlap. Our theoretical analysis showed that when there is overlap, the size index MUSIX will approximate to 50 μ V, and indeed they report an average MUSIX in controls of 52 μ V. When there is no overlap, as in the ALS SIPs illustrated, one can of course measure the unit amplitudes directly, and the MUNIX analysis is hardly necessary. As we indicated in our report (Bostock et al., 2019), only in such exceptional cases is it found that doubling SIP amplitudes has the effect that it should, of halving MUNIX and doubling MUSIX. On the other hand, the ‘SIP doubling’ test will quickly verify that MUNIX can be very misleading for muscles with normal or small motor units, which can only generate a mean (rectified) SIP level of 0.02 mV by superimposition of motor unit potentials.

We do not wish to repeat our arguments in the present letter except to re-emphasize that Nandedkar and colleagues reported a strong correlation between MUNIX and CMAP amplitude in healthy subjects (e.g. Fig. 2 in Nandedkar et al., 2010) without recognizing that this could be due to a limitation of the method. It was, however, recognized that the poor reproducibility (low intra-

class correlation value of 0.52) obtained with MUNIX in APB in a multicenter study was due to the poor reproducibility in CMAP amplitude (Neuwirth et al., 2011). In their Table 5, the relative contribution of CMAP variability to total MUNIX variability for APB was reported as 86.9%.

In conclusion, while MUNIX may appear to work quite well for patients with ALS and greatly enlarged motor units, when a mean rectified SIP level of 0.02 mV is achievable with little overlap, it cannot be regarded as a reliable general-purpose substitute for MUNE, because motor unit overlap inevitably destroys information about motor unit size.

Declaration of Competing Interest

None of the authors have potential conflicts of interest to be disclosed.

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