



## Letter to the Editor

## Letter to the editor concerning the assessment of range and quality of neck movement using a smartphone-based application



Dear Prof Moore and Prof Jull,

We would like to applaud the efforts of Palsson et al. (2019) to evaluate the validity of a smartphone-based application compared to a three-dimensional motion analysis (3DMA) system to assess the range (ROM) and quality of motion (QOM) of the neck in healthy individuals. We would like to draw the attention of the authors to our concerns listed in the letter.

The authors have referred 3DMA as the “gold standard” for measuring the ROM and QOM (?) of the neck. However, we consider the method as a relevant “criterion” or “reference” standard for comparing the smartphone-based application measurements. At one instance (in 2.4. *Statistics*), the authors indeed stated about “criterion-related validity”. We acknowledge that they have investigated “concurrent validity” (a subset of “criterion validity”) of 3DMA and the smartphone-based application.

There is no information on the number and type of cameras used for motion capture. Whether the smartphone-based application used was an inbuilt one with motion sensors (in iPhone 6) or customized by MEDEI (Aalborg, Denmark) needs elaboration. It is not clear if this application needs calibration before use and is it commercially/freely available for smartphone users.

The authors have measured neck ROM only in the sagittal and transverse planes but why they have excluded coronal plane ROM needs justification. The study hypothesized that the smartphone measurements would exhibit good-to-excellent “agreement” (with 3DMA?) for neck ROM and QOM. If so, they could have used “intraclass correlation coefficient” (ICC), and its 95% confidence intervals, instead of “Pearson correlation coefficient”. They must have also reported a (significance) threshold for Bonferroni-corrected p values under 2.4. *Statistics* and  $\pm 2$  standard deviations (?) for the limits of agreement in Fig. 4.

The authors claim that they have found higher (Pearson) correlations for neck ROM compared to those of Quek et al. (2014) but the latter group have used ICCs. In fact, Quek et al. (2014) found that the smartphone measurements were neither valid nor reliable for neck rotations probably owing to magnetic interference.

According to Palsson et al. (2019), the smartphone measurements might vary significantly between sessions and, therefore, this might question the reliability and (criterion-/construct-based) responsiveness of the method. In addition to previous studies in this area (cf. Quek et al., 2014; Stenneberg et al., 2018), further studies on the

responsiveness of smartphone-based application measurements are warranted in healthy individuals and those with cervicogenic disorders to substantiate its clinical application.

At the end of the article, the authors have claimed that an ethical approval is not needed for studies comparing two methods (similar to their study) in accordance with their regional ethics committee. On the contrary, in the methods section, they have stated that their study protocol adhered to the Helsinki declaration and was approved by the regional ethics committee. This needs clarification.

Yours sincerely,

## Ethical approval

Not required.

## Conflicts of interest

None.

## References

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