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AUTHOR'S REPLY

Reply to the letter to the editor of L. Russo et al. concerning "Relationship between sagittal spinal curves geometry and isokinetic trunk muscle strength in adults" by W. Elsayed, A. Farrag, Q. Muaidi, N. Almulhim (2018) Eur Spine J 27:2014–2022

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A Letter to the Editor has been submitted concerning our recently published article [1]. The authors stated that the data collection instrument, Formetric 4D System (DIERS International GmbH, Germany), for spinal postural assessment is invalid and lacks accuracy. In this reply, we will refute the proposed assumptions.

Measurement of spine posture is an essential element for objective evaluation of spine problems. Relying solely on radiological examination, particularly X-ray examination, for the quantification of spinal angles and posture has a well-known hazardous effect associated with long-term exposure [2, 3]. Spinal deviations are primarily managed by rehabilitation professionals, mainly physical therapists, who clinically prefer noninvasive methods for treatment, as well as, assessment. Accordingly, Rasterstereography technique would be a more convenient clinical tool for spinal curvature assessment compared with X-ray examination. Rasterstereography technique or the surface topography method for measuring spine posture is a fast, safe, noninvasive and radiation-free system that can be used to evaluate spinal curvature in clinical settings. Several studies examined its validity and reliability in quantifying spinal frontal and sagittal angles in patients with spinal deviations [4–9] and reliability in healthy volunteers [10, 11]. This shows that the Formetric 4D System (DIERS International GmbH, Germany) has been proven through multiple studies that it is a valid and reliable tool for assessing spinal curvatures, both in the frontal as well as sagittal planes, particularly for scoliotic patients.

However, we do agree with the authors of the Letter to the Editor that furthermore precise research is needed to establish a robust validity for the Formetric 4D System. To the best of our knowledge, no studies have examined the Formetric 4D System validity for evaluating spinal curvature in healthy subjects. Additionally, previous validity and reliability studies have shown variable outcomes and may have suffered limitations in terms of precision and methodological quality. Yet, that does not mean that it is a totally invalid and erroneous measurement tool for clinical and research-based purposes, particularly considering its established validity and reliability in pathological conditions (scoliosis and kyphosis), and the improvement in the mathematical algorithms for constructing 3D spinal structure [12, 13]. Furthermore, in our recent study, we have tried to improve measurement accuracy and precision using reflective markers on the back of participants. Additionally, we implemented strict inclusive criteria to include only subjects of normal body mass to avoid inaccuracies attributed to superficial body fat.

Regarding the second concern in the Letter to the Editor, the authors stated that we inappropriately cited a reference to prove the Formetric 4D System validity for measuring spinal curves, and the findings of that article, which was a significant correlation between the Formetric 4D System scoliotic angle and the Cobb's Angle, do not indicate validity. The authors justified their assumption by stating that "(Cobb's Angle) that is not representative of an anatomical curve." We strongly disagree with their statement. We believe that the Cobb's Angle truly represents curves of the spine, either frontal (scoliotic angle) or sagittal (kyphotic angle). It can be used to accurately evaluate spinal curves

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in normal and pathological conditions. The only difference is its magnitude.

Compliance with ethical standards

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

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