Clinician's Commentary on Akhbari et al.¹

The recent article by Akhbari and colleagues¹ is representative of a growing body of clinical research aimed at providing evidence to support the clinical uptake of biomechanical techniques that measure postural stability.^{2–7} Overall, this body of work has sought to better understand the measurement properties of biomechanical variables that provide insight into the fundamental mechanisms that control postural stability. Although these biomechanical variables have shown promise for measuring clinical change over time,^{1–7} they have not often been examined in the context of randomized controlled trials.⁸

In the context of upright stance, postural stability is often defined as the ability of the nervous system to control the position of the centre of mass (COM) in relation to the base of support (BOS).⁹ Biomechanical measurements of postural stability have traditionally been achieved by measuring the forces exerted through the base of support (kinetics), the movement of the body (kinematics), and the activation of muscle (electromyography). Analysis of the time and frequency domain characteristics of these measures has provided valuable insight into the movement of the COM in relation to the BOS and the basic strategies used to control this movement.¹⁰ Combining these biomechanical measures with variations in the task performed, the environmental context, and individual characteristics has further revealed the complexity of the strategies that the nervous system adopts to control postural stability.⁹ In this context, we can gain considerable insight into the underlying structural and functional determinants of postural instability, particularly where there is an underlying orthopaedic, neuromuscular, or neurological condition. However, the infrastructure and operating costs of conducting such assessments and the expertise required to interpret biomechanical measures may prohibit their application in large-scale, long-term clinical trials.

The recent emergence of accessible biomechanical sensor technology has provided new opportunities to measure postural stability in a variety of contexts beyond the traditional laboratory setting. Examples of this emerging technology include force sensors embedded in active gaming platforms, shoes, and walking surfaces;^{11–13} wireless accelerometers and inertial measurement units;¹⁴ and balance assessment platforms.^{1,15} Such technologies offer clinical researchers opportunities to bridge the gap between fundamental and translational research by accessing information once exclusive to the biomechanical laboratory environment. However, advances in this emerging area of clinical research will be achieved only through significant and sustained commitment to establishing the measurement properties of the biomechanical variables and integrating these variables into long-term prospective observational and randomized controlled trials. The work of Akhbari and colleagues¹ is representative of several studies in the field that have taken the first step along this continuum, providing initial evidence of the potential promise of biomechanical techniques.

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