Effect of Heading a Soccer Ball as an External Focus During a Drop Vertical Jump Task: Letter to the Editor

Dear Editor:

With great excitement, we read the article by Akbari et al[1] entitled "Effect of Heading a Soccer Ball as an External Focus During a Drop Vertical Jump Task." The research idea to study the effect on lower body biomechanics of a dual-focus task compared with a single-focus drop vertical jump is a valuable next step in the understanding of anterior cruciate ligament (ACL) injury. Because we believe this, we wanted to offer further thoughts on the methodology of this study such that future researchers could further elucidate the various aspects of motor control contributing to altered biomechanics.

Akbari et al[1] studied how heading a soccer ball during a drop vertical jump would alter the kinetics and kinematics of a stand-alone drop vertical jump. This was studied to determine whether an added external focus task would result in changes to athlete biomechanics that would increase their predisposition to ACL injury. Significant differences between tasks were seen in peak knee flexion angle, knee flexion displacement, hip flexion angle at initial contact, peak trunk flexion angle, center-of-mass vertical displacement, peak anterior tibial shear force, trunk lateral flexion angle at initial contact, peak trunk lateral flexion angle, knee joint stiffness, and leg stiffness. While this is an impressive list, progress could be made by further considering the methodology of this study.

The stated purpose of this study was to determine the effect of adding an external focus to vertical drop jump biomechanics. However, because of the specificity of a motor pattern in tasks that require high levels of proprioception and dynamic balance, such as in the vertical drop jump,[4] we believe that, instead of observing the effect of an external focus on the biomechanics of a vertical drop jump, the authors rather observed the biomechanics of an entirely new skill. Because the methodology altered the movement pattern in addition to adding an external focus, causality cannot be assigned exclusively to the cognitive aspect of the external focus. The observed changes may have been the biomechanical byproduct of heading a ball midjump, and not the result of the external focus.

Another stated purpose of the study was to represent the biomechanics of a game-like task more accurately in relation to movement injury. This was achieved by adding the heading of a soccer ball, but this does not address the 2 core facets of live play: anticipation and an open environment. The Russian physiologist and movement scientist Nikolai A. Bernstein postulated that anticipation of a task can modulate the motor program.[3] However, unlike live play, the design of the Akbari et al[1] study was anticipatory and not reactive. Further, the pattern tested was highly constricted in a way that cannot be necessarily extrapolated to open and reactive play, as previously discussed. Finally, the specific movement pattern tested was using a stationary target. This likely requires different biomechanics than bracing to contact a moving soccer ball.

The authors completed a very impressive and intensive analysis in this study, and it is also possible to study the concepts mentioned above further and more accurately with some small adjustments. Although contacting a stationary ball may not be optimal for the observation of an external focus or the specific live-play skill, if it is desired for replicability's sake, an alternative is possible to reflect live gameplay more accurately as intended. To differentiate the effect of anticipation, the reactive component, and external focus on biomechanics, 3 soccer balls could be hung linearly in proximity, and a cue given mid-drop as to which ball is the target of contact. Multiple reactive jumps could be attempted in random order, and the analysis would compare the left, center, right, and no-cue attempt groups compared with the pretesting anticipated vertical drop jump attempts for each condition. Notably, the no-cue group would act as a cognitive-only external focus performed midjump. This would delineate the effect of cognitive-versus-physical external foci on drop-jump biomechanics in addition to the reactive and anticipatory nature of the tasks.

The study authors' final note of clinical relevance was that performance/medical staff should train dual-task skills to prevent ACL injury. While we personally agree from a philosophical standpoint, based on the high specificity of dynamic tasks resulting in the unlikely translation of the observed findings to live play and due to only remotely adjacent research suggesting that dual-task attentional focus training may be able to improve landing mechanics with regard to ACL injury,[2] this conclusion seems unwarranted at this time.

Akbari et al[1] created an impressive study with an incredibly novel approach to ACL injury assessment. Thanks to the study of external focus being pursued, there is now a platform for future research to continue building upon the stated findings to further elucidate the effects of the mentioned motor control topics on landing

The Orthopaedic Journal of Sports Medicine, 11(10), 23259671231198262
DOI: 10.1177/23259671231198262

biomechanics in relation to ACL injury. We look forward to continued research in this area.

Seth J. Spicer, MS
Anuoluwapo Fadare, BS
Ajani Morgan, MS
Jennifer Walpow, BS
Stratford, New Jersey, USA

Address correspondence to Seth J. Spicer, MS, ATC, CSCS, FMS (email: spicer39@rowan.edu).

The authors have declared that there are no conflicts of interest in the authorship and publication of this contribution. AOSSM checks author disclosures against the Open Payments Database (OPD). AOSSM has not conducted an independent investigation on the OPD and disclaims any liability or responsibility relating thereto.

REFERENCES

1. Akbari H, Kuwano S, Shimokochi Y. Effect of heading a soccer ball as an external focus during a drop vertical jump task. *Orthop J Sports Med*. 2023;11(4):23259671231164706.
2. Ghanati HA, Letafatkar A, Shojaedin S, Hadadnezhad M, Schollhorn WI. Comparing the effects of differential learning, self-controlled feedback, and external focus of attention training on biomechanical risk factors of anterior cruciate ligament (ACL) in athletes: a randomized controlled trial. *Int J Environ Res Public Health*. 2022;19(16):10052.
3. Profeta VLS, Turvey MT. Bernstein's levels of movement construction: a contemporary perspective. *Hum Mov Sci*. 2018;57:111-133.
4. Ringhof S, Stein T. Biomechanical assessment of dynamic balance: specificity of different balance tests. *Hum Mov Sci*. 2018;58:140-147.