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Critiques

Influence of the trunk on postural control: implications for lower limb injuries

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ABBREVIATIONS
ACL Anterior cruciate ligament

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First, we would like to express our gratitude to the Brazilian Journal of Motor Behavior for inviting us to provide commentary about the paper entitled "How the multiplanar trunk resistance affects the dynamic postural control during single-leg vertical jumps in college athletes with poor movement quality" [1]. Second, we congratulate Cantusio and colleagues [1] for their work in investigating the influence of trunk resistance on postural control in athletes, an important topic that merits further discussion and research.

Sports injuries can arise from external loads resulting in contact injury or from scenarios where contact is absent, which athletes are unable to manage the forces involved, leading to non-contact injury. Frequently, these injuries are associated with high demand tasks such as landing, accelerating, decelerating, or maintaining stability during unilateral support while encountering forces from various directions. To effectively handle internal and external loads during potentially hazardous situations, in addition to possessing adequate muscle capacity, athletes must maintain highly functional postural control. Rapid balance responses are required to compensate for unbalanced situations caused by impacts or when transitioning between different directional changes during a game or competition. De Noronha and colleagues [2] reported that a better performance in the star excursion balance test is a protective factor against ankle sprains. Additionally, Oshima and colleagues [3] suggested that poorer static balance is a predictor of non-contact anterior cruciate ligament (ACL) injury. Therefore, understanding the role of postural control reactions is crucial in comprehending the occurrence of sports injuries.

Investigations linking lower limb injuries and postural control typically concentrate on distal structures, despite the understanding that balance is a systemic factor. This tendency is understandable, especially when considering ankle and hip strategies as mechanisms for maintaining postural control. However, to comprehensively understand the mechanisms underlying lower limb injuries, we must broaden our focus to encompass factors related to the maintenance of postural control and associated movements. Recently, there has been increasing attention given to movements of the upper body as potential strategies for postural control. This is a significant advance because it has been suggested that preventive programs targeting ACL injury inadequately incorporate exercises that reflect injury mechanisms, such as trunk movements and hip dissociation [4]. Therefore, the analysis of postural control should be expanded to include upper body movements, as the trunk can significantly influence the control of the center of mass to maintain balance.

Trunk movements play a crucial role in lower limb biomechanics, particularly in scenarios of disrupted or challenged balance regulation. Hewett and colleagues [5] suggested the concept of neuromuscular imbalance, termed trunk dominance, which contributes to the occurrence of ACL injuries. In such instances, the inability to control trunk movements in all three planes may alter the trajectory of ground reaction forces, increasing the external knee abduction moment, which ultimately could predispose to ACL injury [5].

In this sense, Cantusio and colleagues [1] aimed to investigate how multiplanar resistance applied to the trunk could influence postural control and vertical ground reaction force during vertical jump landings. Their sample consisted of 24 college athletes with poor movement quality during squats. The findings suggested that receiving resistance to the trunk during landings improves the balance in the sagittal plane, as evidenced by decreased center of pressure displacement, while compromising balance in the frontal plane, leading to increased center of pressure displacement. This paper provides valuable insights into the existence of relationship between trunk actions and postural control. Additionally, it highlights the multifaceted role of the trunk, as a single intervention applied to the trunk may

produce opposing effects simultaneously: while beneficial for the anteroposterior balance, it may be detrimental to mediolateral balance. A notable strength of the study is the regulation of resistance applied according to participants' body mass. While the paper reported important findings, there are certain considerations that should be taken into account when analyzing the results.

The authors proposed the utilization of trunk resistance as a potential intervention technique for training purposes. From this standpoint, the study lacks important methodological steps necessary to validate an intervention, such as blinding and randomization. Furthermore, certain statistical parameters raise questions regarding the clinical relevance of the intervention. The sample size may not yield sufficient power, and the confidence intervals encompass values that are debatable from a clinical perspective. While analyzing the technique as a simulation of disturbances that may occur in sports practice, some of the aforementioned issues are mitigated. However, the ability to predict disturbances is a crucial aspect that could compromise the understanding of the influence of trunk resistance on postural balance. Despite the multiplanar resistance employed, participants were aware of the anterior cable resisting their jumps. Consequently, they may have anticipated potential anteroposterior imbalance while disregarding disturbances from other planes. This could explain why this trunk resistance led to an improvement in anteroposterior balance but worsened mediolateral balance.

Nevertheless, the paper under discussion reports significant findings that contribute to advancing our understanding of how trunk actions influence postural control. Future studies can address the aforementioned issues or further investigate population with specific alterations, such as deficits in postural control, people with lumbopelvic instability, or those with lower limb conditions. This enhanced understanding could facilitate the development of protocols applicable to diverse populations, thereby aiding in prevention strategies and sports injury rehabilitation.

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