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Editorial

Sports Biomechanics Applied to Performance Optimization

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The field of sports biomechanics has seen significant growth in recent years thanks to technological advancements [1–5]. The continual evolution of technology has not only enabled precise motion measurement but also facilitated more practical evaluations of the inertial forces in human movements [6–9]. This technological progress has promoted new areas within sports biomechanics, primarily focused on optimizing athletic performance and preventing injuries [5,10–13]. Therefore, this Special Issue of Applied Sciences aimed to provide current information on the latest data analysis and data processing techniques, together with the contemporary methods used, in performance-related sports biomechanics research. This Special Issue features eleven original articles (contributions 1–11), a scope review (contribution 12), and a systematic review and meta-analysis (contribution 13).

Two articles examined the relationship between mechanical parameters derived from the horizontal force–velocity profile and the change-of-direction performance in soccer players (contribution 8) or between the force–velocity relationship parameters obtained from the 20 m sports wheelchair sprint test, the horizontal upper limb ballistic push-off test, and the crack ergometer sprint test in national wheelchair basketball players (contribution 2). In general, while the first study found significant relationships between strength levels and change-of-direction performance depending on task demands, strong relationships between the force–velocity relationship parameters of the three tests were reported in the second study. Furthermore, applying a more recent testing procedure, a study recommended the use of the two-point method to create the load–velocity profiles during the prone bench pull variants (contribution 5). Similarly, another study examined the acceleration–speed profile of soccer players during competition and analysed their seasonal changes and inter player differences over seasons (contribution 4). The authors of this study recommended the assessment of the individual acceleration–speed profile to diagnose potential seasonal changes in sprint performance and prescribing a training intervention tailored to each player.

A systematic review and meta-analysis examined the relationships between ground reaction force, foot positions, and club types in golf (contribution 13). Briefly, this study found that golf clubs may influence the player's posture and swing power. Another study explored the relationship between physical capacities, metabolic capacities, and dynamic three-point shooting accuracy in female professional basketball players (contribution 11). The findings of this study generally indicated that developing coordination, balance, core strength, and relative average power could improve the dynamic three-point accuracy of female basketball players.

A scoping review (contribution 12) synthesised the potential effects of a stack height modification of footwear function and running performance, while another study (contribution 6) examined the biomechanical alterations associated with different running velocities

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of bionic shoes. In summary, the first study demonstrated how reducing stack height can modify the different features of the footwear and, consequently, the running performance. The second study reported a minimal impact of bionic shoes on running performance compared to neutral shoes, although the bionic shoes could contribute to the prevention of running injuries due to the ability to absorb more force and create a more stable state at the hip joint.

Two studies monitored trunk kinematics and kinetics in different movements using a noninvasive wearable sensor (contribution 13) or a functional electromechanical dynamometer (contribution 7), respectively. In general, the first study observed that the vector magnitude of the trunk center of mass acceleration was significantly correlated with performance in male throwers, while the second study found that the reliability of isokinetic and isometric strength manifestations was affected by sex during the horizontal cable woodchop exercise but not during the low cable woodchop exercise.

Finally, it has also been shown that the variation in the rotational position of the cleat influence both cyclist's kinematics and kinetics (contribution 9), while the countermovement depth, body mass, and jump momentum need to be reported alongside jump height to objectively monitor acute neuromuscular fatigue immediately after a soccer match (contribution 10). Furthermore, another study compared the effects of eight weeks of contrast strength training versus combined isometric and plyometric training on physical performance measured in elite junior handball players (contribution 1). The results of this study indicated that isometric and plyometric exercises combined in the same session seem to be a potential strategy to enhance explosive actions.

In summary, this Special Issue provides some insights into the sports biomechanics field, especially the application of sports biomechanics to performance optimization. These thirteen articles allow researchers, athletes, and coaches to take a step forward in the application of theory to practice.

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List of Contributions:

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