

Editorial

# Applied Biomechanics: Sport Performance and Injury Prevention

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This Special Issue had, as its main objective, the compilation of studies on sports performance and its relationship with musculoskeletal injuries. It is a collection of research on eight different sports (soccer, volleyball, swimming, cycling, skiing, golf, athletics, and hockey) considering injuries in general and specific injuries such as hamstring muscle injury, anterior cruciate ligament of the knee, and pain of the pubic symphysis. Additionally, it is noteworthy that most of the studies considered both men and women. Classical biomechanical tools have been used such as 2D and 3D motion analysis, force platforms, and electromyography.

Four studies have focused on soccer, where first the authors addressed differences in the response of muscle activation recorded with surface electromyography between male and female players and its relationship with a hamstring injury [1]. Core stability has also been studied by proposing a test to assess it using professional soccer players [2]. There is an interesting study on a jumping side-volley kicking technique in soccer using a 3D capture system [3]. Finally, we would like to highlight a study on the evaluation of vertical jumps in female soccer players considering fatigue and analyzing the importance of using force platforms instead of contact platforms that only record flight time [4].

Interestingly, we have compiled three studies on volleyball that have focused on the analysis of jumps in relation to anterior cruciate injury when players land on one leg; the authors have used inverse dynamic analysis to conclude that a landing technique based on increased hip, knee, and ankle flexion may decrease the risk of this injury [5]. The authors have also addressed the importance of improving postural balance in female volleyball players as a means of reducing the risk of injury [6]. Finally, we would like to highlight the work on the effect of plyometric training on muscle activation measured with surface electromyography during jumping for the block [7].

The rest of the articles have dealt with different sports. First, we want to present an interesting study [8] about the golf swing technique based on analysis of the plane of motion using a 3D motion capture system; this research was tutored by Dr Young-Hoo Kwon. Notably is the contribution on the effect of the underwater phase in swim starts using 2D photogrammetry [9] with high-level swimmers. The influence of posture on aerodynamic forces in cycling has also been studied to develop a tool to predict forces based on the anthropometry of the subject [10], which may be of great importance for trainers and athletes of this sport. It is always interesting to find information about a sport such as skiing; in this case, the published article carried out a prospective study over four years to find risk factors for musculoskeletal injuries [11]. Again, there is a study that uses 2D movement analysis applied to the 60-meter hurdles in athletics, analyzing runners during an indoor mute championship [12]. Finally, we highlight a study on female rugby players, relating the acute effect of match-play to the strength of the player [13] and research on a



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group of subjects from different sports on the hamstring/quadriceps torque ratio, pelvic posture, and its relationship with symphysis pubis pain [14].

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## References

1. Torres, G.; Armada-Cortés, E.; Rueda, J.; Juan, A.F.S.; Navarro, E. Comparison of Hamstrings and Quadriceps Muscle Activation in Male and Female Professional Soccer Players. *Appl. Sci.* **2021**, *11*, 738. [\[CrossRef\]](#)
2. Etxaleku, S.; Izquierdo, M.; Bikandi, E.; Arroyo, J.G.; Sarriegi, I.; Sesma, I.; Setuain, I. Validation and Application of Two New Core Stability Tests in Professional Football. *Appl. Sci.* **2020**, *10*, 5495. [\[CrossRef\]](#)
3. Zhang, X.; Shan, G.; Liu, F.; Yu, Y. Jumping Side Volley in Soccer—A Biomechanical Preliminary Study on the Flying Kick and Its Coaching Know-How for Practitioners. *Appl. Sci.* **2020**, *10*, 4785. [\[CrossRef\]](#)
4. Armada-Cortés, E.; Barrajon, J.P.; Benítez-Muñoz, J.A.; Navarro, E.; Juan, A.F.S. Can We Rely on Flight Time to Measure Jumping Performance or Neuromuscular Fatigue-Overload in Professional Female Soccer Players? *Appl. Sci.* **2020**, *10*, 4424. [\[CrossRef\]](#)
5. Xu, D.; Jiang, X.; Cen, X.; Baker, J.S.; Gu, Y. Single-Leg Landings Following a Volleyball Spike May Increase the Risk of Anterior Cruciate Ligament Injury More Than Landing on Both-Legs. *Appl. Sci.* **2020**, *11*, 130. [\[CrossRef\]](#)
6. Fuchs, P.X.; Fusco, A.; Cortis, C.; Wagner, H. Effects of Differential Jump Training on Balance Performance in Female Volleyball Players. *Appl. Sci.* **2020**, *10*, 5921. [\[CrossRef\]](#)
7. Wang, M.-H.; Chen, K.-C.; Hung, M.-H.; Chang, C.-Y.; Ho, C.-S.; Chang, C.-H.; Lin, K.-C. Effects of Plyometric Training on Surface Electromyographic Activity and Performance during Blocking Jumps in College Division I Men's Volleyball Athletes. *Appl. Sci.* **2020**, *10*, 4535. [\[CrossRef\]](#)
8. Madrid, M.V.; Avalos, M.A.; Levine, N.A.; Tuttle, N.J.; Becker, K.A.; Kwon, Y.-H. Association between the On-Plane Angular Motions of the Axle-Chain System and Clubhead Speed in Skilled Male Golfers. *Appl. Sci.* **2020**, *10*, 5728. [\[CrossRef\]](#)
9. Stosic, J.; Veiga, S.; Trinidad, A.; Navarro, E. How Should the Transition from Underwater to Surface Swimming Be Performed by Competitive Swimmers? *Appl. Sci.* **2020**, *11*, 122. [\[CrossRef\]](#)
10. Garimella, R.; Peeters, T.; Parrilla, E.; Uriel, J.; Sels, S.; Huysmans, T.; Verwulgen, S. Estimating Cycling Aerodynamic Performance Using Anthropometric Measures. *Appl. Sci.* **2020**, *10*, 8635. [\[CrossRef\]](#)
11. Steidl-Müller, L.; Hildebrandt, C.; Niedermeier, M.; Müller, E.; Romann, M.; Javet, M.; Bruhin, B.; Raschner, C. Biological Maturity Status, Anthropometric Percentiles, and Core Flexion to Extension Strength Ratio as Possible Traumatic and Overuse Injury Risk Factors in Youth Alpine Ski Racers: A Four-Year Prospective Study. *Appl. Sci.* **2020**, *10*, 7623. [\[CrossRef\]](#)
12. González-Frutos, P.; Veiga, S.; Mallo, J.; Navarro, E. Evolution of the Hurdle-Unit Kinematic Parameters in the 60 m Indoor Hurdle Race. *Appl. Sci.* **2020**, *10*, 7807. [\[CrossRef\]](#)
13. Sánchez-Migallón, V.; López-Samanes, A.; Terrón-Manrique, P.; Morencos, E.; Fernández-Ruiz, V.; Navandar, A.; Moreno-Pérez, V. The Acute Effect of Match-Play on Hip Isometric Strength and Flexibility in Female Field Hockey Players. *Appl. Sci.* **2020**, *10*, 4900. [\[CrossRef\]](#)
14. Ludwig, O.; Kelm, J.; Hopp, S. Impact of Quadriceps/Hamstrings Torque Ratio on Three-Dimensional Pelvic Posture and Clinical Pubic Symphysis Pain-Preliminary Results in Healthy Young Male Athletes. *Appl. Sci.* **2020**, *10*, 5215. [\[CrossRef\]](#)