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Editorial

Human Performance and Health in Sport and Exercise

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1. Introduction

For people of all ages and genders, participating in physically demanding sports, whether competitive or recreational, has significant health benefits. According to research, playing sports on a regular basis strengthens bones and muscles, lowers the risk of developing chronic illnesses including diabetes, obesity, and high blood pressure, and improves cardiovascular health [1,2]. Furthermore, sports are important for mental health since they improve social integration and cognitive performance while lowering stress, anxiety, and depression [2]. However, because athletes must strain their bodies to the maximum, competitive sports frequently have a price tag, increasing the likelihood of injuries, exhaustion, and psychological discomfort [3]. A balanced approach to training and rehabilitation is also necessary because retired athletes often face long-term physical and mental health issues, such as joint issues, cardiovascular risks, and post-career identity conflicts [4].

Starting from the basics, assessing physical performance parameters is a fundamental aspect of sports and health science that provides directions to athletes, coaches, and researchers to understand and optimize training methodologies for strength, endurance, power, asymmetry in performance, preventing injuries, and enhancing competitive results [5]. Accordingly, a growing number of scientific investigations highlight the multiple methods available to quantify health, sport, and tactical performance, each focusing on different aspects of an individual's capabilities and skills. For example, critical information on a subject's endurance, recovery potential, and exercise prescription are provided by training load and physiological metrics, such as maximal oxygen consumption (VO_2max), lactate threshold, and heart rate variability (Contributions 1, 2, 3, 4). The importance of these parameters is evident across different sporting contexts and health settings.

This Special Issue includes 15 papers, comprising 12 original articles and 3 reviews, covering several parameters and variables used to quantify physical performance, from physiological and biomechanical determinants of athletic performance to strategies for optimizing recovery, injury prevention, and adapted sports participation. The findings in this Special Issue underscore the necessity of a multidimensional approach to evaluating sport performance, integrating physical, physiological, body composition, biomechanical, and recovery-based assessments, allowing for a more comprehensive understanding of athletic performance and overall health. In particular, these findings provide a scientific base for developing training methodologies tailored to specific sports and individual needs in different settings. The overview and general conclusions of papers published in this Special Issue will be presented in the following text.

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2. An Overview of Published Articles

When it comes to performance analysis, Radaković et al. (Contribution 1) reported a strong correlation between cardiorespiratory fitness and performance in football players, where total match distance and high-intensity running are linked to aerobic capacity. Similarly, in handball, elite players display better reaction times and hand–eye coordination compared to sub-elite athletes, underlining the importance of psychomotor abilities in high-performance play (Contribution 5). Accordingly, analyzing movement dynamics, reaction speed, and gameplay effectiveness is crucial in high-level sports. Prieto-Lage et al. (Contributions 6, 7) explored padel and pickleball by showing that short rally durations and net proximity significantly influence point-winning strategies, providing indications on tactical training. Furthermore, as reported by Macedo et al. (Contribution 4), monitoring training load is important for quantifying the demand on psychological and physiological responses of athletes. Various external and internal load metrics, including GPS-based tracking, accelerometers, heart rate variability, and session rating of perceived exertion, are widely implemented in both team sports (e.g., soccer, rugby) and individual disciplines (e.g., endurance sports, resistance training); therefore, these tools enhance physical performance, injury risk assessment, training monitoring, and exercise management (Contribution 4).

Beyond traditional competitive sports, physiological assessments and training monitoring also play an important role in rehabilitation [6] and adapted exercise programs [7]. In para-sports, Álvarez-Hernández et al. (Contribution 2) demonstrated that para-footballers with cerebral palsy who have lower impairment levels achieve higher speeds and cover greater distances, indicating potentially greater match performance. Generally, these considerations emphasize the role of physiological monitoring in optimizing training programs, ensuring that athletes, both in competitive sports or rehabilitation settings, achieve high adaptation and performance.

Together with physical performance, anthropometric characteristics can also influence health performance, sport success, and injury occurrence [8]. For example, a retrospective study conducted by Ginszt et al. (Contribution 8) analyzed the relationship between climbing experience, anthropometric data, and the best result in sport climbing achieved by male sport climbers in bouldering and lead climbing, suggesting that lower body mass and lower body height are correlated with the better performance in sport climbing. On the same topic, Śliż et al. (Contribution 5) examined handball players and found that body fat percentage, fat-free mass, and total body water influence reaction time, movement time, and response accuracy.

Several studies in the present Special Issue investigated the impact of different specific training regimens on health and physical performance (Contributions 2, 4, 9, 10). In fact, the research conducted by Gavala-González et al. (Contribution 9) on adolescent rowers reveals that specific ergometer-based training enhances power output more effectively than general strength exercises, demonstrating the importance of a sport-specific training program. Furthermore, the improvement in velocity, command, and deception metrics may also be attributed to external facilitator, as shown by Crotin et al. (Contribution 10) in baseball players through the use of intra-abdominal pressure belts, suggesting innovative tools for enhancing performance. Finally, regarding sport-specific skills, Busuttil et al. (Contribution 11) investigated tennis coaching practices, examining how tennis coaches perceive and approach the development of grip positions, a foundational skill in tennis. The findings suggest that teaching grip positions early in training, using physically constraining tools, could improve stroke development while reducing the risk of overtraining injuries.

However, although exercise training and sports participation have been recognized for their positive impact on health, by contributing to physical and mental well-being across different age groups and performance levels, achieving peak performance often requires

significant sacrifices, exposing subjects to risks such as injuries, chronic fatigue, and mental health challenges like anxiety, depression, exercise addiction, and body dissatisfaction [9]. Additionally, it is worth noting that beyond physical training, athletes and physically active subjects' quality of life is influenced by sleep hygiene, dietary habits, and mental health, all playing integral roles in athletic success and health performance achievements (Contributions 11, 12, 13). In line with these influencing factors, Migliaccio et al. (Contribution 14) showed the importance of sleep hygiene for the health and performance of physically active individuals, demonstrating how good sleep hygiene, sleep quality and quantity, and a regular sleep routine are associated with a range of benefits for health and performance including recovery, less risk of injuries, enhanced concentration and attention, improved coordination and muscle strength, mental well-being, and reduced risk of chronic diseases. Similarly, dietary strategies play an important role in recovery. As demonstrated by Bozbay et al. (Contribution 12), pomegranate–black carrot juice supplementation significantly improved mineral metabolism and fatty acid profiles, indicating that an antioxidant-rich dietary intervention can help reduce exercise-induced oxidative stress and promote more efficient recovery.

Beyond high-performance sports and elite athletes, sport and structured physical activity plays a fundamental role in prevention [10] and management [11] of non-communicable diseases, particularly in childhood and adolescent populations, having a big impact on public health [12]. In fact, Uvacsek et al. (Contribution 15) investigated sport and physical activity participation among school-aged Hungarian children, examining the differences in engagement based on weight groups. Their findings revealed that overweight and obese children had almost the same participation rates in sport activities as children in other weight classifications, reinforcing the importance of daily physical education in schools and governmental support of sport in fostering engagement in exercise and reducing obesity risk.

Accordingly, whether in competitive, recreational, home, or green settings, engaging in structured physical activity and sports promotes cardiovascular fitness, muscular strength, and psychophysiological well-being independently from age and clinical condition [13]. In fact, Papamichail et al. (Contribution 13) examined the impact of exercise on balance, functional ability, and depression in a patient with progressive supranuclear palsy, showing significant improvements in mental well-being. This is further confirmed from a study conducted by Gavala-González (Contribution 3) on breast cancer survivors engaging in rowing, indicating improvements in cardiovascular function and overall fitness, underscoring the role of structured exercise as not only essential for athletic performance, but also for clinical populations to recover and long-term health benefits.

3. Conclusions

In conclusion, the studies in this Special Issue collectively highlight the importance of a multidimensional approach to assessing and enhancing health and sport performance. By integrating physical, physiological, body composition, biomechanical, and recovery-based assessments, researchers and practitioners can gain deeper understandings into the factors influencing both athletic achievement and overall health. Moreover, these papers underscore the significance of tailored training methodologies, holistic athlete monitoring, and the valuable role that structured exercise plays in prevention, rehabilitation, and performance optimization. As such, the body of work presented in this Special Issue provides a foundation for advancing best practice in sport, exercise, and health, benefiting athletes, coaches, clinical populations, and overall society.

We extend our gratitude to all contributors whose efforts have enriched this collection and look forward to further advancements in the topic of human performance and health in sport and exercise.

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