Chapter 16
Sports and Fitness Applications of Wearable Technology

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ABSTRACT

Wearable technology has transformed how athletes and fitness enthusiasts train, evaluate, and make health decisions. This chapter explores how sensor innovations, big data analytics, and real-time feedback systems have shaped wearable gadgets, from simple activity meters to multipurpose smart devices. Technique analysis, training load management, injury prevention, and personalized coaching are presented in this chapter. Application examples for professional sports and fitness are covered in the chapter. It also examines data reliability, battery limitations, privacy problems, and socioeconomic inequalities. The final half of the essay covers wearable technology's

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development and its impact on sports science and health management. This section highlights possible future directions such augmented reality, nanotechnology-based biosensors, and enhanced AI.

INTRODUCTION

Within the past decade, the world of sports and fitness has encountered a huge disruption as a result of the emergence of wearable technology as an important facilitator for personalized training, improving performance, and injury prevention (Dovgan, 2023). Wearable technology has advanced to such a degree that it now has the scope to provide much more than simple step counting or heart rate monitoring. Wearable technology now can provide insight into biomechanical movements, physiological elements, and even environmental factors experienced during physical activity (Zainab et al., 2024). This wealth of information is utilized by athletes, coaches, scientists, and passionate recreationalists, aimed at improving performance and making informed health decisions at various levels of sports participation (Nash et al., 2012). The recent boom in wearable technology can be partly explained by the continued advancement of sensor technology, wireless communication, and data analytics over the last couple decades (Ometov et al., 2021). Wearable devices are becoming more common. (Alsubaei et al., (2025), show an extensive range of applications, such as public health projects that utilize community data to inform urban design, or professional sport organizations that use real-time performance monitoring during training. This chapter analyzes the use of wearables in the area of sport and fitness, covering much of the journey of technology development, as well as uses and possible future development. The discussion provides us technical insights, examples, and our thoughts of the new opportunities and issues that are arising (Bråtå et al., 2008). These devices have come a long way, from basic pedometers to advanced multi-sensor smart systems (see Figure 1).