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Sensor-Integrated E-textile for Long-term Physiological Monitoring in Sports

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ABSTRACT

Wearable technologies are increasingly important for monitoring human physiology in sports, rehabilitation, and healthcare. However, current systems rely heavily on rigid electronic modules, wired interconnections, and battery-powered components, which limit comfort, durability, and long-term usability. In sports biomechanics in particular, there is a growing need for sensing systems that can capture high-quality data during dynamic movements, while remaining unobtrusive and mechanically compatible with the body. Existing wearable devices often alter natural movement patterns, limit long-duration use, and fail to provide continuous measurements under real training conditions. In this work, we aim to develop sensor-integrated electronic textiles (e-textiles) that enable long-term physiological and biomechanical monitoring while preserving the inherent properties of fabrics, including flexibility, breathability, and mechanical conformity. Building on recent advances in conductive fibres and textile-based electronics, the research focuses on embedding sensing and communication functionalities directly within textile structures. The proposed approach is particularly suited to sports biomechanics applications, where accurate measurement of parameters such as pressure distribution, motion, and local physiological responses is required under complex, high-impact, and repetitive loading conditions. This allows for more representative data capture during real-world activities, including running, jumping, and endurance training.