GNYACSM Original Research Abstract

Wearable Technology and Machine Learning for Health Analytics in Division 1 Female Soccer Athletes

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ABSTRACT

The integration of wearable technology and edge computing offers a transformative approach to health and performance management in athletics. This study employs these technologies to fill the data analytics gap in women's soccer. **PURPOSE**: To leverage wearable sensors and edge computing for improving injury prevention, performance optimization, and health monitoring among Division 1 female soccer athletes, aiming to address data collection disparities in sports. **METHODS**: Thirteen Division 1 female soccer athletes were monitored via WHOOP wrist sensors from August 2023 to January 2024, generating 11,277 data points. Data analysis in R-Studio utilized Pearson correlation coefficients and simple linear regression to examine physiological responses to training loads. **RESULTS**: Significant correlations ($p < 0.01$) were found between calories and strain (0.85), calories and heart rate (0.53), and strain and heart rate (0.5), demonstrating the impact of training on athlete recovery metrics. Wearable technology revealed key relationships for data-driven insights, with an initial model explaining 52% of recovery variance from training loads. Seasonal data analysis aims to longitudinally track changes, enhancing predictive insights into athlete performance and health over time. **CONCLUSION**: The correlations underscore the transition towards proactive health and performance management in athletics. By employing real-time analytics, this research advocates for a strategic shift in monitoring athlete wellbeing—from traditional, reactive practices to utilizing predictive frameworks, optimizing training and recovery processes. This approach enhances the immediate understanding of athlete condition and provides an informed, data-led strategy in athlete management for long-term health, emphasizing the role of technology in advancing sports science.