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Investigating Energy Consumption and RSI Risk in Badminton Players Using IoT Sensors

This study focuses on the relationship between energy consumption and the risk of repetitive stress injuries (RSI) in badminton players. By utilizing MPU6050 IoT sensors, strategically placed on the player's body and equipment, we aim to gather precise data on force inputs, shot types, and overall energy expenditure throughout the game. This data will inform strategies to enhance player performance while minimizing injury risk.

Objectives

The primary goal is to measure energy consumption during badminton matches and analyze its correlation with the likelihood of RSI. We aim to identify patterns and trends that can be used to develop more effective training regimens, improving energy efficiency and reducing the risk of injury.

Methodology

We use MPU6050 sensors placed on key locations like the player's wrist, hand, and shoulder, as well as on the racket's net side, to record acceleration data. This data is then converted into force measurements. Additionally, we use a smartwatch to track calorie expenditure per game, offering a comprehensive view of energy use. Our key steps include:

1. Calorie Measurement: Tracking energy expenditure using a smartwatch.
2. Shot Analysis: Recording various shot types to understand their impact on energy use.
3. Energy Calculation: Estimating total energy consumed per game, compared to standard benchmarks.
4. Force Input Measurement: Assessing the force applied during each shot to evaluate its contribution to energy use.
5. RSI Prediction: Using shot frequency, type, and energy metrics to predict the likelihood of RSI.

We also plan to plot velocity diagrams to visually demonstrate the link between acceleration and energy output, helping to identify movements that could increase injury risk.

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Expected Outcomes

We anticipate that this study will provide a comprehensive analysis of energy dynamics in badminton players, offering insights into the connection between energy expenditure and RSI risk. The findings are expected to contribute to the development of a predictive model for RSI based on energy use and shot patterns, aiding in the design of training programs that maximize efficiency while reducing injury risk.