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एवं खेल मंत्रालय
MINISTRY OF
YOUTH AFFAIRS
AND SPORTS

CERTIFICATE OF RECOGNITION

CONGRATULATIONS

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Date: 07/11/2025

To,
Design for Bharat – Viksit Bharat Design Challenge 2025,
Ministry of Youth Affairs & Sports, Government of India,
New Delhi.

Subject: Letter of Certification – Institutional Endorsement for Participation in *Design for Bharat – Viksit Bharat Design Challenge 2025*

Dear Sir/Ma'am,

This is to certify that **Ms. Khudsiya Rahman, Ms. Gagana P and Ms. Ganga Prasanth** bearing Registration No: **R24HE025, 25141000532 and R24HB004** are a bonafide students of School of **Allied Health Sciences, REVA University, Bengaluru, Karnataka.**

The institution endorses and authorizes his/her participation in the *Design for Bharat – Viksit Bharat Design Challenge 2025* organized by the Ministry of Youth Affairs & Sports, Government of India.

We further confirm that the information provided by the student in the application is true to the best of our knowledge, and the institution will extend full support and facilitation during the course of the challenge.

(Signature & Seal)

Head of the Institution
Vice Chancellor
REVA University
Rukmini Knowledge Park
Yelahanka, Bengaluru - 560 064

Title: Tracking triumph: sensor and technology in sports and fitness

PRESENTED BY : KHUDSIYA- B. Sc BPT 3RD SEM

GANGA- B. Sc MR&DI 3RD SEM

GAGANA P- M.Sc BIOCHEMISTRY 1ST SEM

ABSTRACT

- In the realm of sports science and athletic training, maintaining optimal body posture and alignment is paramount for enhancing performance and preventing injuries. This research presents an innovative smart sensor system embedded in athletic apparel, specifically designed to monitor and correct the posture of athletes during exercise routines. The developed sensor is equipped with a sophisticated feedback mechanism that alerts the user through auditory signals when improper body alignment is detected. This proactive approach aims to cultivate better exercise habits and reduce the risk of injuries associated with poor posture. The sensor is integrated with a mobile application that serves as a comprehensive hub for daily exercise tracking and activity planning. Athletes can utilize the app to log their workouts, receive real-time feedback from the sensor, and evaluate their adherence to prescribed postural guidelines. This feedback loop not only facilitates immediate correction but also fosters long-term improvement in body mechanics. In cases where injuries occur, the application offers a novel feature that allows users to upload imaging results, such as X-rays, along with medical prescriptions from healthcare professionals. This integration is designed to refine exercise regimens, adjusting them according to the user's recovery progress and any limitations outlined by medical guidance. By systematically analyzing user data, the app will generate customized exercise plans that accommodate existing injuries while promoting recovery and rehabilitation. The effectiveness of the sensor system, a series of empirical studies will be conducted involving athletes from various disciplines. These studies will measure the degree of postural correction achieved through sensor feedback and its correlation with improvements in athletic performance. Additionally, user satisfaction and engagement will be evaluated through surveys and qualitative interviews, aiming to ascertain the overall impact of the technology on athletes' training and injury management. This research not only contributes to the field of sports technology but also emphasizes the importance of a holistic approach to athlete care—one that blends biomechanical analysis with user-friendly digital solutions. Ultimately, the goal is to empower athletes with the tools they need to achieve peak performance while minimizing their risk of injury. Through this innovative framework, we aim to create a sustainable model for athlete health monitoring that aligns with evolving standards in sports performance and medicine. Future work will delve into refining the sensor's capabilities, expanding its applicability across various sports, and exploring its integration into broader health and wellness programs. This research not only aims to demonstrate the sensor's utility in real-time posture correction but also as a foundational step toward a comprehensive athlete support ecosystem that prioritizes efficiency, safety, and recovery.
- ***Keywords*:** posture monitoring, athletic training, injury prevention, biomechanical feedback, mobile application, sports technology.

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INTRODUCTION

- A healthy lifestyle is the foundation of success in sports and fitness
- It combines balanced nutrition, proper rest, regular exercise, mental wellness and discipline to help individuals achieve peak performance and long term health
- A balanced nutrition which include all the dietary food ingredients with proper and adequate value
- Fitness of the body mainly is all about focusing about the body posture, the prevention of wear and tear of muscles and ligaments
- Basically emphasizing all the functional properties of an athlete



OBJECTIVE OF STUDY

- To develop a sensor that basically can sense and detect about the posture of a sports person while performing exercise
- To develop an app which keeps a track on the daily activities of the person and help maintaining a multidisciplinary day-to-day activities
- To promote a nutritional literacy which will help in boosting and maintaining nutrition
- To validate the app through clinical monitoring and red light therapy



METHODOLOGY

• 1. Sensor:

- Purpose: to capture the body movements and postural data in précised way
- Components: (i) IMU (inertial measurement unit)- measures accelerations, gyroscopic motion and orientation
- (iii) Flex sensors: detect joint angle and body alignment
- (iii) Heart rate sensor: tract exertion level during activity
- Placement: sensors are placed on key joints

2. Mobile application module (app):

- Posture: display 3D or diagram showing current vs ideal posture
- Provide real time feedback, stores session performance for progress tracking
- Nutrition planning features:
- Collects athlete detail: sport type, goals, calories needs, preferences
- Uses algorithm or app to generate a personalized diet plan
- Allows for tracking diet

3. Infra-red therapy:

- When the athletes will complain about sever pain to the app
- Through the app indication the sensor will produce low level light therapy (LLIT) to reduce pain

System overview and technologies used

The system integrates advanced tools for health monitoring and analysis. Sensor firmware is developed using Arduino IDE and Embedded C/C++. BLE Stack and mobile APIs enable wireless connectivity, while Flutter or React Native support app development. Data is managed with Firebase, SQLite, or MongoDB. Machine learning models using TensorFlow Lite or Core ML assist in posture correction. Python with Nutrition APIs powers the diet and therapy engine. Cloud and backend operations use AWS IoT, Google Cloud, or Node.js, and visualization is done through MATLAB, Figma, and Postman.

For mobile app development, cross-platform frameworks like Flutter (Dart) and React Native (JavaScript) allow building Android and iOS apps using a single codebase. Native apps can also be developed using Android Studio (Kotlin/Java) for Android and Xcode (Swift) for iOS.

✅ Recommendation: Flutter is ideal for this project as it efficiently connects sensors via Bluetooth and provides a smooth user interface for health tracking.



Placement Of Sensor

Sensor-Based Wearable Systems for Monitoring Human Motion and Posture: A Review” covers wearable sensors placed on limbs/trunk for posture monitoring



Bosch Sensortec. BMI270 – Smart ultra-low power Inertial Measurement Unit (IMU). Datasheet BST-BMI270-DS000-07

RESULTS AND DISSCUSIONS

- **Posture detection accuracy:**

- The result of the study will be getting the sports person habituated for a proper posture
- The postures like both static and dynamic
- If any minor injury has occurred, the algorithm changes and the manages according to requirement

- **Nutritional:**

- According to the diet plan the athlete will have meal based on calorie value
- Like carbohydrates, proteins, fats, hydrations and micronutrients will be priorly planned

- **Therapy:**

- For minute pain the low-level frequented therapy will give relief for instant period of time
- The light is absorbed by mitochondria the “powerhouse” of the cells
- Mitochondria use that light energy to make more ATP which is the energy currency the body uses for repair and regeneration

CONCLUSION AND FUTURE

Expected outcomes:

- (i) Reduced injury risk through real time posture correction
- (ii) Improve training efficiency
- (iii) Better nutrition and recovery planning
- (iv) Comprehensive health monitoring for athletes
- (v) Lowering the pain efficiency

The future:

- (i) To built on app and sensor which is cost effective and performs optimizing through data driven insights
- (ii) This integrated system merges wearable technology AI based posture correction and holistic wellness tracking, Supporting athletes to train smarter prevent injury and optimize performance through data driven insights