BEYOND THE BREAK: A MICRO:BIT ASSISTED TRAINING DEVICE FOR LOWER BODY BONE RECOVERY

RoyIn Na Phatthalung[1,*], Thampaphon Saengphen[2]
[1]Thai Singapore International School (Samutprakarn, Thailand)
[2]Samsenwittayalai (Bangkok, Thailand)

Corresponding Author Email: royinnaphat@gmail.com

Abstract

Patients recovering from a broken or fractured bone in the lower body often experience immobility, weakened strength, and pain during everyday activities. While hospitals recommend physical therapy, patients frequently fail to perform exercises correctly after discharge. This can worsen their condition or lead to hospital readmission. To address this, we developed a Micro:bit-based device that tracks common lower-body exercises: Seated Knee Extension, Straight Leg Raise, and Sideways Hip Abduction, to ensure they are performed correctly. The system utilizes the Micro:bit's accelerometer and a machine learning classifier trained via CreateAI. By providing the AI with over 40 samples per movement, the device learns to distinguish between correct forms and errors. The hardware consists of a 3D-printed holder attached to a leash and Velcro strap. A rep counter only updates when the Micro:bit detects a full, correct movement; patients must complete ten perfect repetitions to finish one set. Key innovations include a countdown timer for user preparation and the integration of "negative samples" into the AI to minimize errors. These exercises scale in difficulty, providing patients with both physical progression and a mental goal to stay motivated. Results demonstrate positive detection with a low margin of error, ensuring users receive effective home therapy. By reinforcing discipline and correct form, this device helps patients return to their normal lives faster. Future developments include a sleeker, professional design and a mobile dashboard to record statistics that can be shared directly with doctors for remote monitoring.

Keyword: Bone recovery, Micro:bit, Machine learning, Lower body rehabilitation, Wearable training device.