

MODULE 1 - P2: Developing a community-centric digital health technology ecosystem to improve elderly mobility

Sai G.S. Pai¹, Kai Zhe Tan¹, Parastoo Fahimi¹, Huanyu Bao², Edmund Lee², William R. Taylor^{1,3}, Navrag Singh^{1,3}

¹Singapore-ETH Centre, Future Health Technologies Programme, CREATE campus, Singapore

²Wee Kim Wee School of Communication and Information, Nanyang Technological University, Singapore

³Institute for Biomechanics, Dept. of Health Sciences and Technology, ETH Zurich, Zurich, Switzerland

1 Motivation

- Current approaches for mobility assessment are subjective involving qualitative assessments and self-reported data
- Use of wearables is generally limited to clinical settings
- Mobility assessments that are performed in clinical settings may be contaminated by the Hawthorne effect
- Due to cost and mobility limitations, the elderly may not be able to easily visit clinicians for consultations
- Lack of motivation among the elderly to use wearables and health apps

2 Objectives

- Motivate elderly residents to exercise, improve mobility and their psychological and social well-being
- Improve digital literacy and raise awareness regarding benefits of using digital health technologies (DHTs)
- Develop technologies based on wearables and health applications that could be scaled for use in community settings

3 Approach

- Participatory and gamified usage of DHTs in community settings
- DHTs comprising of inertial measurement unit (IMU) sensors and SingaporeWALK, a wearables-based app for mobility assessment

Research Question: Will this approach be more effective in improving elderly mobility and well-being than traditional non-participatory approaches (e.g., in clinical settings)?

4 Research Plan

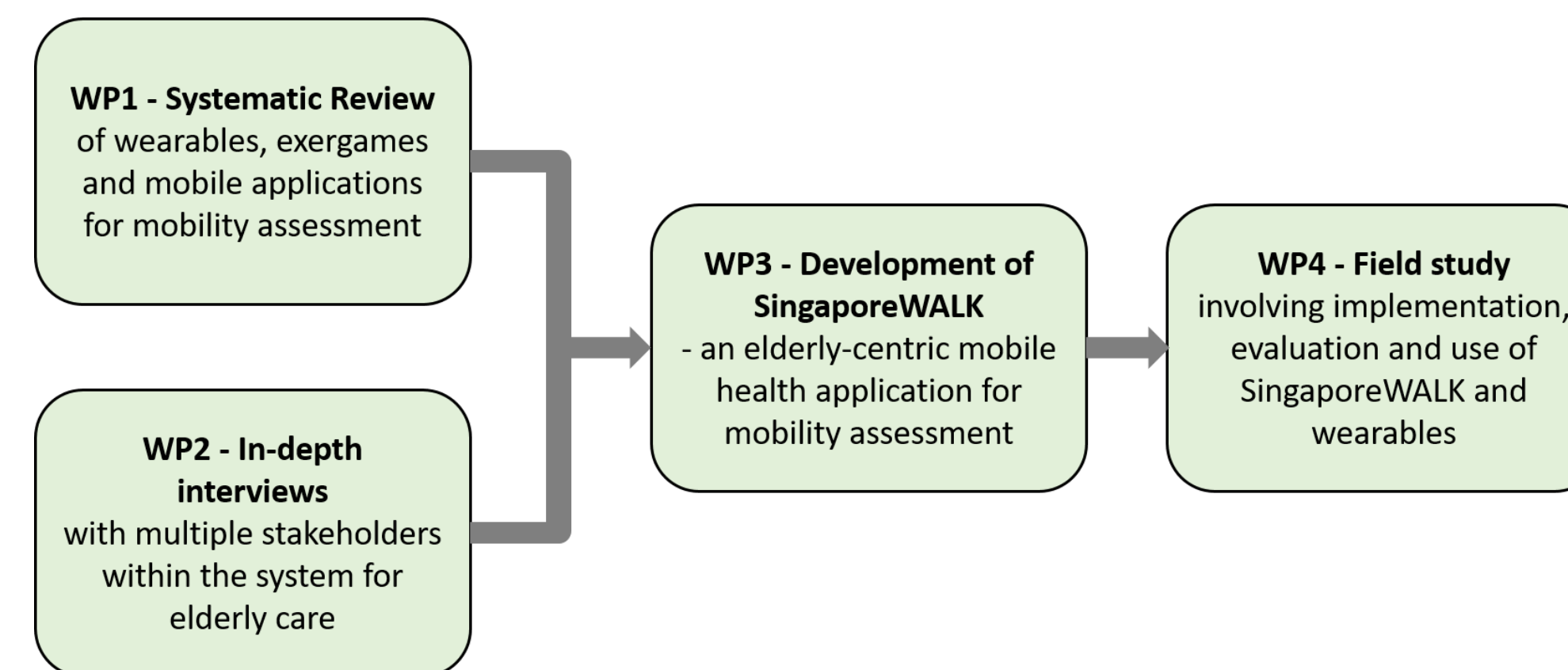


Figure 2: The plan is divided into four work packages (WP) with developments from WPs 1 and 2 supporting app development in WP3 and field study in WP4.

- Data collected during the field study will be analysed to derive mobility and gait related metrics, corresponding variability and changes over time (5 weeks)
- Kinetics and kinematics of movement will be analysed from wearables data using mechanics-based machine learning models

5 SingaporeWALK

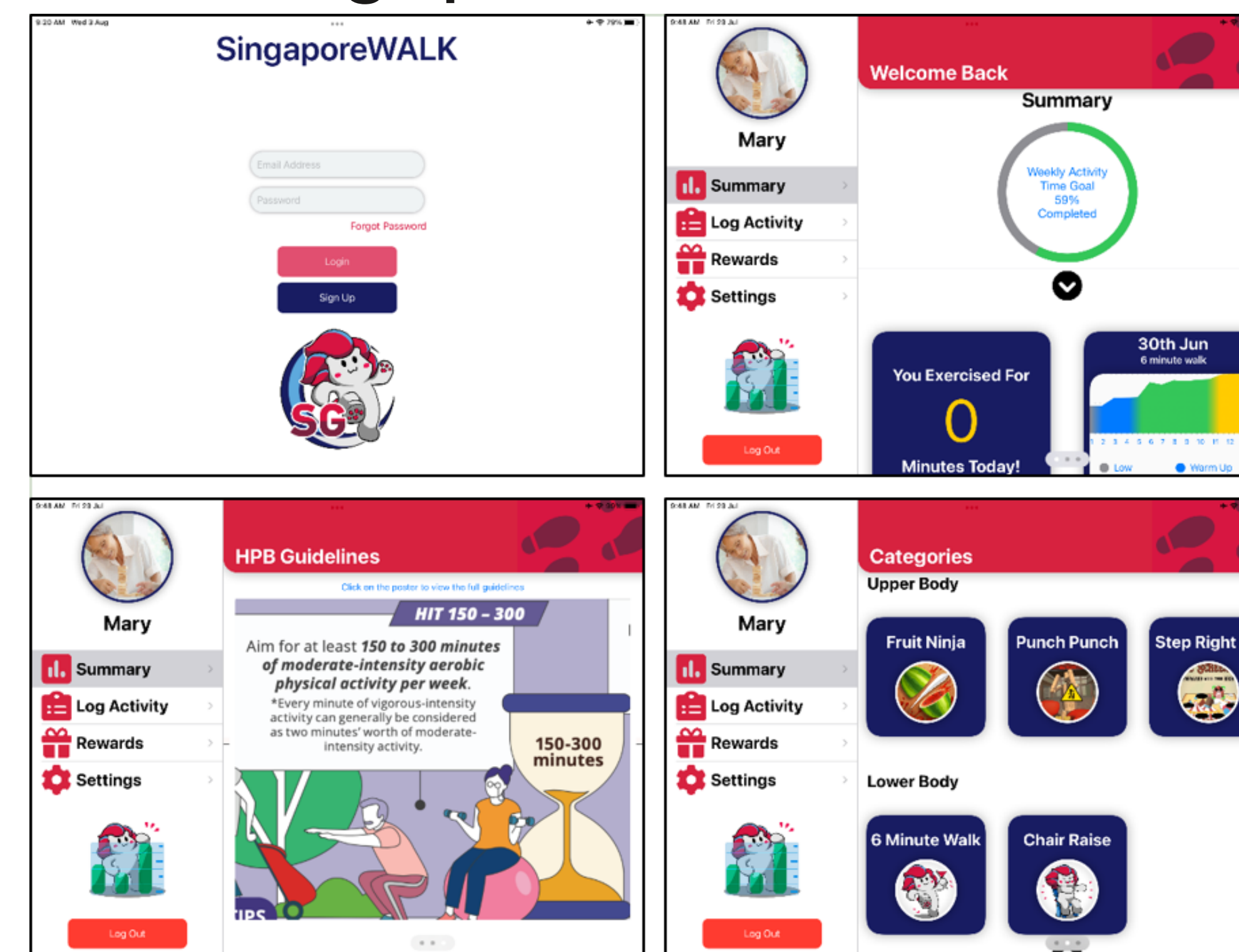


Figure 2: SingaporeWALK is an iPad application for extracting, recording and visualizing data collected using wearable sensors.

6 Exergaming and Wearables

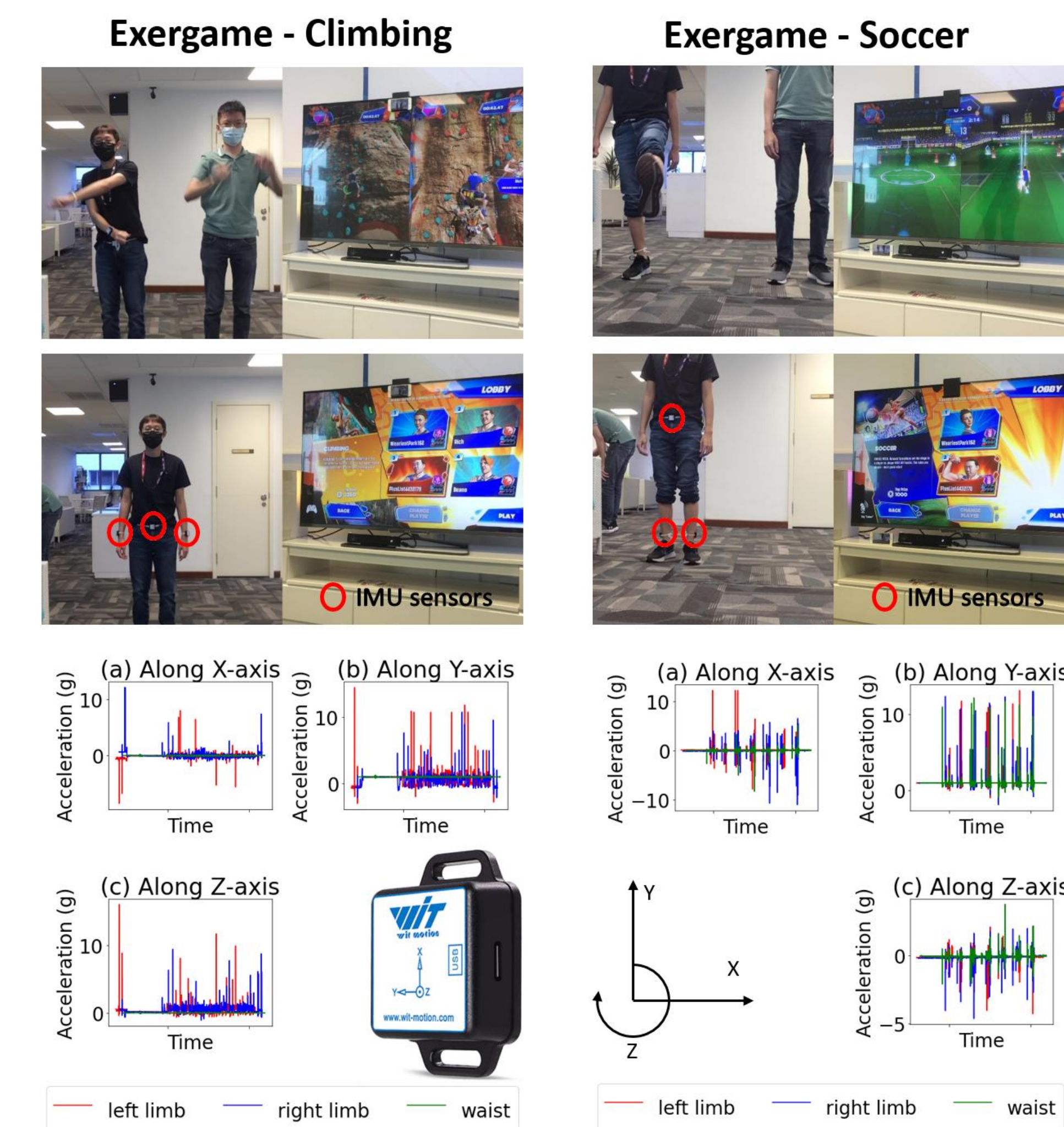


Figure 3: Participants involved in playing exergames such as climbing, soccer, fruit ninja and piano steps wear multiple IMU sensors. Data recorded using these sensors is collected, analysed and visualised with the support of the SingaporeWALK app.

7 Outlook and Impact

1. Bring capabilities of the gait lab from the clinic to the community using wearables
2. Democratize access to and use of wearables and apps among the elderly to improve well-being and adherence to exercise behaviours by building capacity.
3. Create tangible partnerships among elderly centres across Singapore for participatory use of DHTs.

