

Northern Australian Regional Digital Health Collaborative

Seed Funded Project

Fusion of wearable and environmental sensors for remote monitoring of health and wellbeing in elderly populations

Elderly Australians living in rural, regional, and remote areas generally have poorer access to healthcare than their counterparts in urban areas. This has serious implications for health outcomes, with higher rates of injury, certain chronic diseases, and death linked to rurality. At the same time, the need to travel for care can cause significant stress for individuals and their communities. Early detection of health problems is essential to reduce the long-term burden of disease on geographically isolated older Australians.

Wearable devices offer significant potential for the continuous and non-invasive monitoring of health parameters, enabling this earlier detection of health issues. In this project, we developed a deidentified database linking physiological data obtained from a research-grade wearable device with reference physical and mental health measurements.

The physiological data obtained from the Empatica EmbracePlus wearables includes heart, sweat, and motion activity waveforms captured continuously throughout recording sessions with healthy volunteers. A range of additional data including steps taken and temperature are also captured. While the wearables were recording, participants were asked to undertake physical and cognitive tasks. Reference vital sign (heart rate, blood pressure, respiratory rate, blood oxygen saturation, and temperature) measurements were taken at three stages: sitting at rest, standing after walking, and sitting after cognitive task. Additionally, participants selfassessed their stress and physical and mental fatigue at the start and end of the session. All recorded data are timestamped, enabling wearable data to be linked with reference measurements.

The resulting database is a rich resource for exploring the potential of wearables for continuous and non-invasive health monitoring. It will facilitate the development of novel methods for the measurement of physical and mental health parameters from wearable sensor data. It will further enable assessment of relationships between









wearable sensor data and various physical, mental, and cognitive health parameters – potentially enabling the identification of novel biomarkers linked with different health states.

Our next step as a research team is to address the open challenge of measuring blood pressure and respiratory rate continuously and non- invasively, through training artificial intelligence models to link wearable heart activity data with these vital signs. Further, our team will investigate the relationship between wearable sensor data including heart and sweat activity with stress and fatigue, again using artificial intelligence.

Overall, the rich database developed in this project will be valuable in building a future where reliable and high-quality health monitoring is available to all elderly Australians, regardless of their geographic location.

Project Lead: Dr Stephanie Baker

Key Messages

Elderly Australians in rural and remote areas face barriers to healthcare access, resulting in poorer health outcomes, higher injury rates, chronic diseases, and mortality. The difficulty of travelling for care worsens these issues, highlighting the need for early detection.

The project uses Empatica EmbracePlus wearables for continuous, non-invasive monitoring. A deidentified database links wearable data (heart rate, sweat, motion, steps, and temperature) with reference health measurements.

The database will aid research on developing AI models for non-invasive monitoring of blood pressure and respiratory rate and studying the link between wearable data and stress or fatigue indicators.

> Learn more about NARDHC









bhn

