Our two digital health projects address activity detection in older adults who need more tailored feedback/reports of their body posture than is possible with commercial wearables. These projects use small worn sensors (MbientLabs MetaMotionR) that stream accelerometer data via Bluetooth Low Energy to custom iOS applications, iMup and One Thing Straight. iMup is designed to give health care teams a tool to meaningfully measure mobility and reduce inactivity of hospitalized patients. One Thing Straight helps people with Parkinson’s Disease (PD) track their upper-body posture by sending discreet reminders to an iPhone when a non-erect posture is detected.

Research indicates that more than 1/3 of hospitalized older adults are being discharged with a major new functional disability in activities of daily living because of the amount of time spent immobile in bed1. iMup aims to track movement by identifying five key postures: laying, reclining, sitting, standing and walking. Two sensors are worn by the patient, one near the collarbone and another on the thigh. Raw accelerometer data collected via a custom app is then post-processed through a machine learning algorithm used to extract the positions from the accelerometer readings. The time spent in each position can be reported to the clinical care team at key times, such as between shift changes.

PD-influenced poor posture can lead to balance problems2, pain3, and increased spine and muscle rigidity4. One Thing Straight uses the accelerometer data to provide discreet notifications to the user to correct their posture. Since checking a phone is a normal, unremarkable action, this project helps users retain privacy and autonomy while living with a disability. The small size of the sensor allows it to be put it in a shirt pocket or clipped to the collar. The baseline angle can be adjusted in consultation with a clinician. The app archives data in daily and weekly reports of ‘straight’ and ‘not straight’ posture times so the user can see if their posture is changing over time.

Using these sensors has allowed our team to access raw accelerometer data from locations on the body that aren’t accessible via wrist-worn devices like FitBit or Apple Watch. These projects are being presented on the same poster as part of the LiveWell digital health portfolio and are developed in association with the LiveWell Rehabilitation Engineering Research Center (RERC). This grant develops and validates information and communication technology projects for people, regardless of ability, to improve the capacity for independent living.

1 Covinsky KE, Pierluissi E, Johnston CB. Hospitalization-associated disability: "She was probably able to ambulate, but I'm not sure". JAMA. 2011; 306(16):1782-93.

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3 Watanabe, K., Hirano, T., Katsumi, K. et al. International Orthopaedics (SICOT) (2015) 39: 2433. https://doi.org/10.1007/s00264-015-3011-4

4 Park, Jeong-Ho et al. “What Is Wrong with Balance in Parkinson's Disease?.” Journal of movement disorders vol. 8,3 (2015): 109-14. doi:10.14802/jmd.15018