Information and Communication Technology to Promote Safety and Independence
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Mission and Purpose
• To promote information and communication technology (ICT) access for all people regardless of ability
• To promote awareness of the need for equitable access to developers
• To develop/validation ICT applications to improve the capacity for independent living and community participation
• The following are examples of current ICT development projects at Duke University

Alexa Stress Assist
• Military service members with traumatic brain injury (TBI) and post-traumatic stress disorder (PTSD) are taught various grounding evidenced based strategies as an intervention to post-traumatic stress (PTS)
• Grounding: strategies designed to immediately connect a person with the present moment to avoid re-experiencing past trauma and pain. Often designed to redirect focus to environmental features, i.e. sound, lighting, smells, temp.
• ASA is a proof of concept system designed around the Amazon Echo and the Samsung SmartThings platform
• A custom SmartThings SmartApp enables user customization and control
• Next Steps: Developing back-end interface for customization of interactions. Beta testing at the Shepherd Center SHARE Military Initiative in Atlanta, GA
• The system provides grounding by:
  • Changing environmental controls (lights, music, temperature, scents)
  • Playing personalized recordings (e.g. recording of cherished family member)
  • Prompting user to initiate breathing exercises or other evidence based grounding techniques
  • Contacting family member or provider by phone, email or text
  • Data logging and analysis

One-Thing-Straight (1TS)
• Individuals with Parkinson’s Disease (PD) can lose postural awareness resulting in a forward flexed posture while sitting and standing.
• Can lead to dangerous conditions such as falls
• Many people with PD can correct their posture with cueing.
• 1TS is an iOS application + microcontroller based sensor to track postural movements
  • Sensor tracks flexed posture via accelerometer worn on the user’s collar
  • Postural data is sent via Bluetooth to the user’s phone and user is notified by discrete tone or vibration to correct their posture
• Next Steps: Clinical testing and app finalization
• Developed in collaboration with the Duke Institute for Health Innovation – Mike Revoir and Jack Livingston: Rapid Health App Prototyping Center

Gait Speed Monitor
• Walking (gait) speed is a strong predictor of functional status & survival amongst older adults
• Current measurement method requires either expensive equipment or a trained technician and is prone to error between timers and trials
• The Gait Speed Monitor is a low cost alternative to current methods
  • Utilizes LIDAR sensor technology to measure and calculate walking speed
  • Recent verification and validation testing with a cohort of healthy elders show 96% correlation with trained timers and 99% with more expensive timer systems

Safe@Night
• People with cognitive/judgement disorders who may wander throughout the house or outside during the night
• Created a system of sensors that communicate via a microcontroller:
  • Microcontroller mediates web data-logging
  • Client identification and tracking via 802.15.4 (low data rate WPAN) protocol
  • Room movement tracking via passive infrared (PIR) sensors
  • System will play audible reminder via hallway and room speakers after ‘x’ minutes of continued wandering
  • Persistent wandering or entrance into dangerous areas will immediately notify a caretaker via text message or audible alert
• Current Status: 1st prototype, including web data logging, Client ID and tracking, and room movement sensors are set up and functioning
• Next Steps: Improve hardware selections for power and cost performance

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