Motivation and application domain

Neglect is a failure to respond to stimuli presented to the side opposite the brain lesion observed in ~25% of stroke survivors. Encouraging patients to direct their gaze towards contralesional space showed some success in reducing neglect. However, patients failed to generalize to tasks outside the training environment. This negative outcome likely resulted because patients required frequent reminders to attend to the impaired side, and in the real world, such cues are not readily available.

General objectives and main activities

We will develop wearable technologies that address neglect by providing therapeutic stimulation (ubiquitous cue therapy) to the contralesional body. We will employ user-centered design techniques to create a fashionable package that patients actually want to wear and use. If possible, we will evaluate user acceptance and the efficacy of ubiquitous cueing in a small cohort of stroke survivors in the acute phase of recovery. Inpatients will receive either standard of care (SOC, the control condition), or SOC + 2 weeks of ubiquitous cueing. During cueing, patients will wear a stimulator unit on the hemiparetic arm, providing bouts of simultaneous vibrotactile and audio cueing twice a day (10 sessions per week) over a period of 2 weeks. Within each bout, the stimulator will cue patients to make 60 visual scans of the contralesional arm and hand. Neglect will be tested at 3 time points: upon consent to participate; after session 1; and at the end of the intervention.

Training Objectives (technical/analytical tools, experimental methodologies)

The student will learn:
1. Designing, building, and controlling a wearable stimulation system (CAD, embedded microcontroller circuitry)
2. Testing and calibration procedures
3. Mixed software skills (C/C++, Matlab, microcontroller programming)
4. Human subject testing: user acceptance testing

Place(s) where the thesis work will be carried out: Neuromotor Control Laboratory, Marquette University, Milwaukee WI USA; Medical College of Wisconsin, Milwaukee WI USA

Additional information

Pre-requisite abilities/skills: Programming skills in Matlab; Interest in developing microcontroller-based technology. Some basic circuit building skills.

Maximum number of students: 1
Financial support/scholarship:  bando giovani